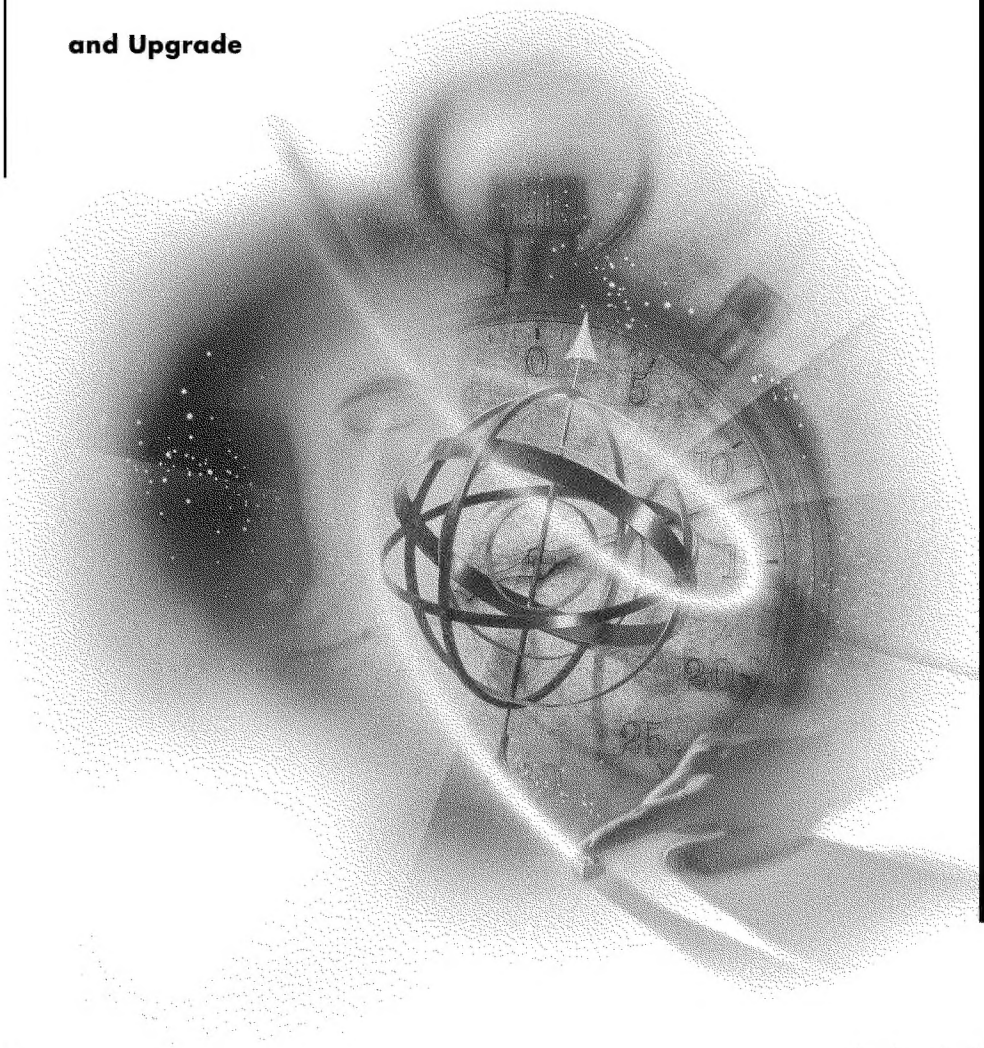
NetWare Installation and Upgrade



NetWare® 3.12
NETWORKING SOFTWARE

Novell®

March 21, 2000
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NetWare 3.12 System Messages
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How to Use this Manual

Which Part of this Manual You Should Use

This manual is divided into three sections:

- *For all networks:* Learn NetWare v3.12 features and enhancements by reading "Features" on page 13.
- *For new networks:* Learn how to perform a first-time NetWare network installation by reading "Install a New NetWare Server" on page 17.
- *For existing networks:* Learn how to upgrade to NetWare v3.12 from NetWare v2.x or v3.x or other network operating systems by reading "Upgrade an Existing File Server" on page 191.

Other Technical Support

- *Context-sensitive help.* If you are using a NetWare menu utility and want more information about how to complete a task, press <F1>.

  If you are unsure how to use a command, type the command name and add the /? option for help. For instance, for help with the RIGHTS command, type RIGHTS /?.

- *Hardware manuals.* Many network problems occur because of malfunctioning hardware.

  If you can isolate a problem to a certain computer component or cable segment, check the manuals that came with the hardware involved.

- *Novell online documentation.* The Novell online documentation viewer allows you to read NetWare manuals from your Windows or OS/2® workstation.

1 Features

High Performance

NetWare v3.12 takes full advantage of 386 and 486 processors, increasing network capacity and performance.

NetWare v3.12 supports up to 250 concurrent users while providing the fastest performance of any network operating system on the market.

Unlike general-purpose operating systems, NetWare v3.12 is designed specifically to provide the performance necessary for network computing.

Security

NetWare's security features make sure you control access to network resources and data. These features include

Login security
Rights security
Attribute security
File server security
NCP authentication

Data Protection

Read-after-write verification, Hot Fix, disk mirroring, disk duplexing, resource management, and UPS monitoring increase network dependability by safeguarding data against failure in critical parts of the network hardware.

Network Management and Administration Tools

A NetWare Loadable Module™ (NLM™) is a software module that links dynamically to the operating system.

NLMs simplify network installation and enable the addition of server-based applications while the server is running.

Remote console services enable you to enter any server command from your workstation.

The MONITOR utility displays resource usage statistics tracked by the operating system.

Network Applications

Novell provides third-party developers with Application Programming Interfaces (APIs) and development tools to help them design products to run on a NetWare network.

This ensures that you can easily find off-the-shelf applications that meet your needs.

Modular Design

With an open network server platform, you can add services and enhancements and communicate with a variety of file server and workstation types.

You can also add customized modules or tools that can be loaded or unloaded from the file server while it is running.

Support for Multiple Environments

- *Cross Platform Consistency* allows DOS, UNIX®, Macintosh®, and OS/2 workstations to connect to the same server and share a consistent set of network resources.
- *Open Data-Link Interface*TM (ODI™) makes NetWare v3.12 an open server platform upon which a Multiple Link Interface Driver™(MLID™), a unique kind of NLM, is built.

These specifications allow multiple protocols such as IPX/SPX, TCP/IP, and AppleTalk® filing protocol to share the same driver and network board.

- *STREAMS* allows multiple protocols to exist in a single file server.

Enhancements

"NetWare v3.12 compared to NetWare v2.2" on page 15 shows some important changes to NetWare since v2.2.

Table 1 NetWare v3.12 compared to NetWare v2.2

Specification	NetWare v2.2	NetWare v3.12
Hard disks per volume	1	32 (or 16 if mirrored)
Volumes per server	32	64
Volumes per hard disk	16	8
Directory entries per volume	32,000	2,097,152
Maximum volume size	255 MB	32 TB
Maximum file size	255 MB	4 GB
Maximum addressable disk storage	2 GB	32 TB
Maximum addressable RAM	12 MB	4 GB
Maximum volume name length	15 characters	15 characters
Maximum directory/file name length	14 characters	12 characters (DOS format)
Name space support	DOS, Macintosh	DOS & Windows, Macintosh, UNIX, FTAM, OS/2
Disk block sizes	4 KB	4 KB, 8 KB, 16 KB, 32 KB, 64 KB

2 Install a New NetWare Server

First-Time Installation Overview

What you'll do:

1. Prepare your site and equipment. See "Ensure Proper Power and Power Conditions" on page 20.
2. Set up file server hardware. See "Prepare Your Site and Equipment" on page 19.
3. Install file server software. See "Install the File Server Software" on page 31.
4. Plan your network environment, create the directory structure, install applications, load files, define users, and set up security. See "Set up the Network" on page 83.
5. Customize your network operating environment. See "Create Login Scripts" on page 145.
6. (Optional) Bring your servers up to peak performance. See "Optimizing Network Performance" on page 289.
7. Prepare and install workstation equipment. See the following
   - Workstation Basics and Installation.
   - NetWare Workstation for DOS and Windows.
   - NetWare Workstation for OS/2.
   - Set up your network printing environment. See Print Server.

3 Prepare Your Site and Equipment

NOTE: If your network hardware is already installed and meets site and power conditioning requirements, go to "Install the File Server Software" on page 31.

What You Need

To prepare your network location, you must

- Fulfill the hardware requirements
- Ensure proper power and power conditions
- Set up computer hardware
- Make working copies of NetWare diskettes

Hardware Requirements

You need the following hardware for installing a NetWare v3.12 file server.

- A PC (or PC compatible) with a 386 or 486 (SX or DX) processor.
- A minimum of 4MB of RAM.
- A hard disk with sufficient storage for your network. The minimum required is 50 MB: 5 MB for a DOS partition plus 45 MB for a NetWare disk partition containing volume SYS:.
- If you plan on installing Novell online documentation(the NetWare v3.12 documentation in electronic form) on the server, add another 30 MB of disk space.

- One network board.
- Network cabling (Ethernet, ARCnet®, 10BaseT, Token ring, etc.).
- (If installing from CD-ROM) A CD-ROM reader.

Ensure Proper Power and Power Conditions

Procedure

1. Check the operating environment and power requirements for your equipment.

   Consult the documentation provided with your computer for specific requirements in the following areas:

   Temperature/humidity
   Maximum altitude
   Power source
   Power frequency
   Power requirements
   Power consumption
   Heat dissipation

2. Use dedicated power lines and grounded outlets.

   Use dedicated power lines for all hardware components on your NetWare network (file servers, workstations, printers, etc.). Connect only network components to these lines.

   Electrical outlets should be standard 3-wire (NEMA 5-15R) grounded outlets, with the *ground wire connected to an earth ground.* (If you connect the ground wire to conduit ground, be sure that the conduit ground is an earth ground.)

3. Install power conditioning equipment.

   Because network hardware components are sensitive to power fluctuations, use some kind of power conditioning equipment on all power lines connected to components:

   - *Uninterruptible power supplies* (UPS). These protect server hardware from power fluctuations with a regulating uninterruptible power supply.

In addition to protecting server hardware from damage caused by power surges and voltage spikes, a UPS protects data held in RAM during a power failure.

IMPORTANT: We strongly recommend that you also use UPS protection for network workstations and other peripherals.

- *Other power conditioning devices.* If using a UPS is not feasible, try to equip your network hardware with power conditioning devices.

  Many devices are available that protect equipment from various irregularities, such as electrical noise and voltage spikes.

  These devices include line-surge suppressors (also called power conditioners and line filters) and ferro-resonant isolation transformers.

  Connect network hardware through at least one of these devices to protect them from minor power surges such as those resulting from common electrical power fluctuations.

  These devices offer some protection and are inexpensive, although they have the following disadvantages:

- They do not protect hardware components from large power surges such as lightning strikes.
- Data held in RAM is lost if there is a power failure.
- Network maintenance costs are higher with line-surge suppressors and ferro-resonant isolation transformers than with uninterruptible power supplies.

  However, network maintenance costs are lower with suppressors and transformers than with no power conditioning devices at all.

  For more information on power conditioning devices, see *Concepts*.

4 Protect network equipment from static electricity.

Take the following protective measures:

- Treat carpets with anti-static chemicals (available in spray form from most computer stores).
- Use protective covers for carpets, such as the anti-static type or conductive covers connected to an earth ground.

Don't use plastic or other synthetic carpet protectors near network equipment because such protectors generate large amounts of static electricity.

- Ground equipment through a one megaohm resistor to bleed off the static slowly and avoid a static discharge from conductive surfaces.
- Make sure that personnel working on open equipment chassis take precautionary measures, such as wearing grounded wrist straps.

Set Up Hardware

NetWare v3.12 file servers can operate on many kinds of hardware. To ensure that there are no conflicts, use unique interrupt request (IRQ) settings on file server boards.

NetWare prompts you to enter your board settings, gives you available alternate settings, and determines if your settings are valid. (If you don't need the prompts, see "Load Disk Drivers" and "Load LAN Drivers" in *System Administration*.)

Calculate Necessary Server RAM

To calculate your file server's total RAM requirements, perform the following steps. (NetWare v3.12 can support up to 4GB of RAM and up to 32TB of disk storage space.)

Procedure

1. Make sure that you have a minimum of 4 MB of RAM for loading the operating system, disk and LAN drivers, and INSTALL.NLM.
2. Add 2 MB to install one or more of the following:
   - Additional NetWare products (such as NetWare for Macintosh, NetWare for NFS, etc.).
   - A print server on this server (PSERVER.NLM).
   - Any of the following NetWare loadable modules: CLIB.NLM, STREAMS.NLM, BTRIEVE.NLM. (Many systems need these NLMs.)

3 Multiply the amount of your system's disk space (in megabytes) by 0.008 and add this number to the number arrived at in Step 1 and Step 2.

   For example, multiplying 200 MB by 0.008 results in 1.6 MB.

4 Add 1 to 4 MB for additional cache buffer RAM to optimize performance.

   The more RAM you can allot to cache buffers, the better your system's performance will be.

If you have an EISA file server that contains more than 16 MB of RAM, do *not* use 8-or 16-bit AT busmastering or DMA boards in the server. For more information, contact the manufacturer.

NOTE: If you have a 386 computer manufactured in 1987, it may not carry out some 32-bit instructions. This could adversely affect the functioning of NetWare.

If a problem exists, NetWare displays a message. You may be able to correct the problem by replacing a ROM chip on the board. For more information, see your computer reseller.

Install and Configure Your Hardware

Procedure

1 Record the following hardware information on the File Server Worksheet found at the end of this manual.

- File server: name, make, and model.
- Memory size.
- Non-network boards: type and settings (Optional).

  Network Boards: associated LAN drivers, network number, I/O address, memory address, interrupt, or station address.

  Some NetWare drivers and default settings are listed in the tables that follow.

  For more information about settings, see the documentation that came with your network board.

Table 2 Default LAN driver settings for ISA network boards

LAN driver	I/O Address	Memory Address	Interrupt
TRXNET	2E0	D000	2
NE1000	300		3
NE2000	300		3
PCN2 (primary)	620	CC00 (RAM)	2
PCN2 (alternate)	628	CC00 (RAM)	2
Token	A20	D800 (RAM)	
3C503	300	C8000	3
3C505	300	5 (DMA)	3

- For microchannel file servers, use the *Reference* diskette to set the disk coprocessor boards.

  Defaults for the following microchannel network boards are set by the *Reference* diskette. NetWare may ask for the slot number.

  TOKENDMA
  NE/2TM
  TOKEN
  NE/2-32TM
  3C523

- Options for the NE3200TM EISA network board are set by the computer's configuration utility. NetWare needs the slot number and frame type.

  For details, see the documentation that came with your network board.

- Floppy diskette drives: diskette size and storage size.
- Internal disks: make, model, and storage size.
- Disk coprocessor boards: DCB drivers and I/O address.

Default settings for disk coprocessor boards (DCBs) for standard architecture file servers are based on the type of PAL chip installed at position U3.11 and U4.11 on the board.

Jumper settings must also match the PAL, which controls the interrupt I/O address. The defaults are listed in "Default settings for DCBs" on page 25. (For alternate settings, see the DCB supplement.)

Table 3 Default settings for DCBs

U3.11	U4.11	I/O Address	Interrupt
814-198-001	814-197-001	340	B
814-198-001	814-197-002	348	C
814-198-002	814-197-001	320	A
814-198-002	814-197-002	328	F

- Disk subsystems: number of drives, drive types, storage size, number of heads and cylinders.
- Mirrored disks.

2 Install hard disks and network boards.

2a If necessary, set switches or jumpers on hard disks and network boards.

Set each address and interrupt according to the worksheet you completed in Step 1.

2b Install internal hard disks and check for proper jumper settings and termination.

See your hard disk documentation, or see "SCSI Bus" in *Concepts*.

2c Place each board in a slot in the file server.

IMPORTANT: If you install Token-Ring boards, cable the boards in the file server to the MAU before installing the operating system. Otherwise, the TOKEN driver will not load.

2d Connect peripheral equipment to the file server and check jumper settings and termination.

See the documentation for each peripheral, or see "SCSI Bus" in *Concepts*.

3 Configure the hardware by using the hardware's setup (reference or configuration) program.

For details on the setup or reference program, see the documentation that came with your computer.

- If your hardware supports it, use a power-on password to secure the file server from unauthorized use.
- *Do not* select "Set network server mode" if your hardware has it listed in its setup program.

  This mode disables keyboard input after DOS executes an AUTOEXEC.BAT file. As a result, you could not use the keyboard after the file server booted.

  Instead, use the keyboard protection feature in MONITOR. See "MONITOR" in *System Administration*.
- Do not change the arbitration level of the MFM or ESDI fixed-disk driver from the factory default setting. NetWare requires the default setting.

4 (Conditional) Install the CD-ROM either as a network device or as a DOS device, according to manufacturer's instructions.

5 (Conditional) If you are using an IBM® PS/2® computer, do *not* set it to SERVER mode.

6 Record the setup information on the File Server Worksheet.

For microchannel machines: make sure you record the type of controller in microchannel machines. You need this information when you load disk drivers later.

NOTE: When installing two or more of the same type of network board, check your network board documentation to avoid address conflicts.

If you have problems getting your hardware to run, see "Troubleshooting Guide" in *System Administration*.

7 (Conditional) If you will be using a DCB disk driver for a disk subsystem, run DISKSET.EXE before installing your NetWare server.

8 Install your NetWare v3.12 file server by following the procedures under "Install Server Software" on page 31.

During installation, you are advised of optional procedures that you can perform, such as disk mirroring, disk duplexing, partitioning, etc.

Make Working Copies of the NetWare Diskettes

Before you install software, make working copies of the NetWare diskettes. Use only the working copies.

Procedure

To make working copies of the NetWare diskettes,

1 Boot a personal computer with DOS.

2 Use the DOS DISKCOPY command to format and copy each NetWare diskette to a high-capacity diskette.

3 Label each copied diskette with the same name that appears on the original diskette.

4 After making working copies, store the original NetWare diskettes in a secure place.

HINT: Throughout the installation, when you are instructed to insert a specific diskette, use the working copy.

Making 5.25-Inch Working Copies

For 5.25-inch diskettes, use XCOPY to copy the files to a hard disk and then copy them to 5.25-inch diskettes. You must have a PC or existing NetWare file server with 30 MB of available disk space.

Procedure

1 Create a network directory called NETWARE.

2 Change to the newly-created directory.

3 Insert the *Install* diskette into a disk drive and type

```
XCOPY A: /S/E <Enter>
```

4 Repeat Step 3 for each diskette.

5 When all NetWare diskettes have been copied to the NETWARE directory, format a 5.25-inch, high-density diskette and make it bootable by typing

```
FORMAT A:/S
```

6 Label the diskette *Install*.

7. For the remaining diskettes, insert each 5.25-inch, high-density diskette into the disk drive and type

   ```
   FORMAT A:/V
   ```

   Label each diskette with the disk name that corresponds to the 3.5-inch diskette.

8. Change to the directory that corresponds to the appropriate diskette label.

9. Insert a diskette and type

   ```
   XCOPY *.* A: /S/E
   ```

10. Repeat Step 7, 8, and 9 until all diskettes in the NetWare directory are copied.

4 Install the File Server Software

If you are doing a first-time installation, complete the tasks explained in "Prepare Your Site and Equipment" on page 19 before beginning with this chapter.

Necessary Resources

- The file server *Installation* quick path card to get an overview of the process.
- A copy of the File Server Worksheet (located at the end of this manual).
- NetWare v3.12 CD-ROM, working copies of NetWare v3.12 diskettes, or access to NetWare v3.12 installation files on a server.
- Working copies of third-party disk drivers, LAN drivers, or NLMs (optional).

Install Server Software

Install your NetWare v3.12 file server software by following the procedures under the headings that follow.

During installation you are advised of optional installation procedures (disk mirroring, disk duplexing, partitioning, etc.).

Choose Your Installation Medium

You can install NetWare v3.12 from floppy diskettes, from CD-ROM, or from a network directory. Instructions for installing from each medium are found in the following sections.

Installing from Floppy Diskettes

Procedure

1. Make working copies of all NetWare v3.12 diskettes.

   For instructions, see "Make Working Copies of the NetWare Diskettes" on page 27.

2. Determine the method you will use to boot your file server by reading "Determine File Server Boot Method" on page 34.

3. Based on your decision in Step 2, follow the procedures under "Install Server Software for Use with a DOS Boot Diskette" on page 35, or continue with Step 1 under "Installing from Floppy Diskettes" on page 32 on "Installing from Floppy Diskette" on page 38.

Installing from CD-ROM

If you have a CD-ROM device that shares a SCSI bus with a disk subsystem and contains volumes to which NetWare installation files are copied (typically volume SYS:), your keyboard may lock up while copying SYSTEM and PUBLIC files.

Possible Solutions

- Mount the CD-ROM as a NetWare volume to continue the installation after the server is loaded. See "Mounting a CD-ROM as a NetWare Volume (Conditional)" on page 64.
- If the CD-ROM device has a parallel-to-SCSI adapter, reconfigure the CD-ROM under DOS to use this adapter, instead of the shared SCSI bus.
- Obtain a separate SCSI board for the CD-ROM device and repeat the installation. Load the NetWare SCSI driver for the subsystem SCSI board only.
- Create volume SYS: on the internal hard disk of the server, rather than on the subsystem drive. Do not load the NetWare SCSI driver until after installation.

Procedure

1. Install the CD-ROM drivers according to the manufacturer's instructions.

   Usually, the installation program updates the CONFIG.SYS and AUTOEXEC.BAT files to add the CD-ROM device driver.

   You may, however, need to update these files yourself. Follow the manufacturer's instructions.
2. Insert the NetWare v3.12 CD-ROM into the CD-ROM reader.
3. Turn on the CD-ROM reader.
4. Reboot the computer.
5. Change to the drive letter corresponding to the CD-ROM, then change to the NETWARE.312/*ENGLISH* directory and type

   ```
   INSTALL <Enter>
   ```
6. Continue with Step 1 under "Installing from CD-ROM" on page 39.

Installing from Network Directory

NOTE: You can install from a network directory only if you already have a NetWare server (of any version) installed on your network.

Procedure

1. Create a NETWARE directory on an existing network server and copy the files from the installation media to that directory.

   For example, if you are copying from CD-ROM drive E: to network drive K:, you might type

   ```
   K:MD NETWARECD NETWAREXCOPY E: /S /E
   ```

   NOTE: This copies not only the NetWare files, but also the Novell ElectroText online documentation. If you copy the entire CD, you will need approximately 100MB of free disk space.

   Or, if you are copying from floppy diskettes, make subdirectories for the *Install*, *Unicode*, and *System*_x diskettes. You might type

   ```
   K:MD NETWARE.312CD NETWARE.312MD INSTALLMD
   UNICODEMD SYSTEM_1...MD SYSTEM_8
   ```

Then, for each subdirectory you created, change to the subdirectory and copy all files and subdirectories from the floppy diskette. You might type

```
CD INSTALLXCOPY A: /S /ECD..
```

Then repeat the three commands above, substituting the Unicode diskette and all the *System*_x diskettes for the *Install* diskette.

2. On every computer you want to make a NetWare v3.12 server, create a DOS partition of at least 5 MB.
3. Install NetWare DOS workstation software on each prospective server.

   For instructions on installing workstation software, refer to the installation instructions in Workstation for DOS and Windows.
4. On every computer you want to make a NetWare v3.12 server, map a drive to the network server directory that contains the NetWare v3.12 files.

   HINT: For ease of use in specifying the path, use a MAP ROOT command.
5. If you copied from CD-ROM in Step 1, change to the NETWARE.312*ENGLISH* directory. If you copied from diskette, change to the INSTALL directory and type

   ```
   INSTALL <Enter>
   ```
6. Continue with Step 1 under "Installing from CD-ROM" on page 32.

Determine File Server Boot Method

If you install from diskette, before you install the server software, determine whether you want to boot your file server from a boot diskette or from a small DOS partition on the file server's hard disk.

NOTE: If you install from CD-ROM or from a network directory, you must have a DOS partition on your server's hard drive.

Use "File server boot options" on page 35 to determine which method.

Table 4 File server boot options

Boot option	Advantages	Disadvantages
Boot DOS from a diskette	Creating boot diskettes is faster than creating DOS partitions on the hard disk. The entire internal hard drive can be used for a NetWare partition. Boot diskettes can be stored separately from the file server to prevent tampering.	Booting from diskette is significantly slower.
Boot DOS from a partition on the hard disk	After installation, booting the file server is significantly faster. Risk of media failure is much less. If you want space for troubleshooting NLMs (such as INSTALL and VREPAIR), in addition to a large number of disk drivers and the operating system (SERVER.EXE), the DOS partition size can be made large enough for all of these.	The DOS partition (if you follow our recommendation) takes at least 5 MB of disk space.

IMPORTANT: Machines that do not have an internal (channel 0) controller must boot with a boot diskette. Only hard disks attached to a standard-bus internal controller can boot from a DOS partition.

After you choose a boot method, continue with "Install Server Software for Use with a DOS Boot Diskette" on page 35 or go to "Install Server Software for Use with a DOS Partition on the Hard Disk" on page 38.

Install Server Software for Use with a DOS Boot Diskette

NOTE: This installation option is available only when installing from floppy diskette.

To determine whether to boot from a boot diskette or from a DOS partition, see "File server boot options" on page 35.

Necessary Resources

- A separate computer with DOS and a hard drive
- A high-capacity floppy diskette For a standard architecture file server, use DOS 3.1 or later. For a microchannel file server, use DOS 3.3 or later.

Procedure

1. On a computer other than the server, create a directory for temporary storage of the server boot files.
2. Copy the following files from the *System_1* diskette to the directory you created in Step 1.

   SERVER.EXE
   NUT.NLM
   INSTALL.NLM

3. Create the server boot diskette.

   3a Copy the NWSNUT.NLM from the *System_8* diskette to the designated directory. Place the *Install* diskette in drive A: and type

   `A:NWXTRACT A: NWSNUT.NLM [path] <Enter>`

   Replace *[path]* with the path to the directory you created in Step 1.

   You are prompted with the following message:

   ```
   Place a master data file diskette in drive A: and press
     Enter, or Esc to Exit.
   ```

   3b Leave the *Install* diskette in drive A: and press <Enter>.

   You are then prompted to insert the *System_8* diskette (which contains NWSNUT) into drive A: to uncompress NWSNUT.NLM.

   3c Copy the disk driver for your system from the *System_1* (for Novell drivers) or *System_2* (for third party drivers) diskettes to the designated directory.

   To determine which disk driver, use "Disk driver determination" on page 47.

   3d (Optional) Copy the files in "Optional boot diskette files" on page 37 that apply.

Table 5 Optional boot diskette files

Copy	If
LAN_driver	You want a copy in case your LAN driver located on volume SYS: becomes corrupted.
VREPAIR	You want a utility for repairing volume SYS: or you added name spaces to volumes and want a way for VREPAIR to repair those volumes.
Name space support	You added name spaces to volumes.

4. (Conditional) Create an AUTOEXEC.BAT file in the designated directory that includes the following command:

   ```
   SERVER
   ```

   Use this command if you want the server to load automatically when the computer reboots.

   For information on creating an AUTOEXEC.BAT file, see your DOS manual.

   NOTE: You can set a speed switch in most file servers to enable them to boot faster. With some file servers (such as COMPAQ), you can also use the MODE.COM command to set the boot speed to High.

   Find MODE.COM on one of the diskettes that came with your computer and copy MODE.COM to your boot diskette. Include the following command in the AUTOEXEC.BAT file:

   ```
   MODE SPEED=HIGH
   ```

5. Format a high-capacity diskette for the server's A: drive with the /s parameter.
6. Copy the files from the designated directory to the new bootable diskette.
7. Place the new server boot diskette in the server's A: drive.
8. Reboot the server.
9. Go to "Name the file server." on page 42 to continue the installation.

Install Server Software for Use with a DOS Partition on the Hard Disk

To determine whether to boot from a boot diskette or from a DOS partition, see "File server boot options" on page 35.

Installing from Floppy Diskette

Procedure

1. Insert the *Install* diskette in drive A: and reboot your computer, or change to drive A: and type

   ```
   INSTALL <Enter>
   ```

2. From the "Select an Installation Option" menu, select "Install new NetWare v3.12."

3. Determine your DOS disk partition requirements. If you already have an adequate DOS partition, select "Retain Current Disk Partitions" and skip to Step 1. To create a new DOS partition, continue with Step 3a.

   We strongly recommend that you create a DOS partition.

   However, if your file server doesn't have an internal hard disk or can't have one for security reasons, you must boot from diskette. If so, see "Install Server Software for Use with a DOS Boot Diskette" on page 35.

   Your bootable DOS partition must have at least 2 MB of free (usable) space, though we recommend that you allocate a minimum of 5 MB.

   3a Select "Create a new DOS partition or retain DOS partition."

   If you select the option to retain a DOS partition, skip to Step 1.

   WARNING: If your hard disk contains a previous DOS partition, continuing with the next step will erase that partition and destroy all data. Be sure you have backup copies of those files before continuing.

   You can exit INSTALL to make backup copies by selecting "Exit to save files" from the "Disk Partition Options" menu.

   3b Select "Create a DOS partition."

   3c Enter the size (in MB) of the new partition.

   Be sure to leave plenty of available disk space for your NetWare partition.

   NOTE: To mirror two internal hard disks and boot from the DOS partition on drive 0, create the same-sized DOS partition on both hard disks. If drive 0 should ever go bad, you can use the DOS partition on drive 1 to boot from.

You must reboot your server so that DOS recognizes the new partition. Pressing any key automatically reboots the server. Be sure the *Install* diskette is in drive A:.

NOTE: Some revisions of NetWare v3.12 prompt you for a non-existent *NetWare-1* diskette. If prompted, insert the *Install* diskette instead.

4 Restart INSTALL by typing

```
INSTALL <Enter>
```

5 Format the newly-created DOS partition.

When INSTALL starts again, it recognizes that an unformatted DOS partition exists on your hard disk and prompts you to begin formatting.

5a Press <Enter> to continue.

INSTALL now loads FORMAT.COM.

A warning similar to the following appears:

```
WARNING All existing data on non-removable disk C: will
  be destroyed!-Continue (Y/N)?
```

NOTE: This message is generated by FORMAT.COM. The partition table has already been created and previous data is unrecoverable at this point.

5b Type "Y" to continue.

After the format is complete, total disk space and available disk space are displayed.

5c Press any key to continue.

6 Continue the installation by following the procedures under "Name Your Server and Copy Boot Files" on page 42.

Installing from CD-ROM

Procedure

1 From the "Select an Installation Option" menu, select "Install new NetWare v3.12."

2 Determine your DOS disk partition requirements. If you already have an adequate DOS partition, select "Retain Current Disk Partitions" and follow the procedures under "Name Your Server and Copy Boot Files" on page 42.

Your bootable DOS partition must have at least 2 MB of free (usable) space, though we recommend that you allocate a minimum of 5 MB.

2a From the "Disk Partition Options" menu, select "Create a new DOS partition."

WARNING: If your hard disk contains a previous DOS partition, continuing with the next step will erase that partition and destroy all data. Be sure you have backup copies of those files before continuing.

You can exit INSTALL to make backup copies by selecting "Exit to save files" from the "Disk Partition Options" menu.

2b Select "Create a DOS partition."

2c Enter the size (in MB) of the new partition.

Be sure to leave plenty of available disk space for your NetWare partition.

NOTE: To mirror two internal hard disks and boot from the DOS partition on drive 0, create the same-sized DOS partition on both hard disks. If drive 0 should ever go bad, you can use the DOS partition on drive 1 to boot from.

3 Make sure that the *SYSTEM_1* diskette is in drive A: prior to rebooting your system.

WARNING: All data is destroyed on an existing DOS partition. This could include the driver used to access the CD-ROM.

4 Reboot the computer.

5 Format the new DOS partition. At the A: prompt, type

```
DOSTOOLS\FORMAT C: /X/S <Enter>
```

NOTE: The /X option is a DR DOS option that indicates you are formatting a hard disk.

6 To access the CD-ROM drive, reinstall the CD-ROM drivers on the DOS partition. Install the CD-ROM device drivers according to the CD-ROM manufacturer's instructions.

7 Reboot the computer after installing the CD-ROM drivers.

8 To restart INSTALL, change to the NETWARE.312*ENGLISH* directory and type

```
INSTALL <Enter>
```

9 Select "Retain Current Disk Partitions" and follow the procedures under "Name Your Server and Copy Boot Files" on page 42.

Installing from a Network Directory

Procedure

1. From the "Select an Installation Option" menu, select "Install new NetWare v3.12."
2. Determine your DOS disk partition requirements. If you already have an adequate DOS partition, select "Retain Current Disk Partitions" and follow the procedures under "Name Your Server and Copy Boot Files" on page 42.

   Your bootable DOS partition must have at least 2 MB of free (usable) space, though we recommend that you allocate a minimum of 5 MB.

   2a From the "Disk Partition Options" menu, select "Create a new DOS partition."

   WARNING: If your hard disk contains a previous DOS partition, continuing with the next step will erase that partition and destroy all data. Be sure you have backup copies of those files before continuing.

   You can exit INSTALL to make backup copies by selecting "Exit to save files" from the "Disk Partition Options" menu.

   2b Select "Create a DOS partition."

   2c Enter the size (in MB) of the new partition.

   Be sure to leave plenty of available disk space for your NetWare partition.

   NOTE: To mirror two internal hard disks and boot from the DOS partition on drive 0, create the same-sized DOS partition on both hard disks. If drive 0 should ever go bad, you can use the DOS partition on drive 1 to boot from.
3. Make sure that the *System_1* diskette is in drive A: prior to rebooting your system.

   WARNING: All data is destroyed on an existing DOS partition. This could include the client software.
4. After the system reboots, format the new DOS partition. At the A: prompt, type

   ```
   DOSTOOLS\FORMAT C: /X/S <Enter>
   ```

   NOTE: The /X option is a DR DOS option that indicates you are formatting a hard disk.
5. To access the server containing your NetWare v3.12 directory, reinstall the client files on the DOS partition.

6 Reboot the computer after installing the client files.

7 Log in to the server and change to the directory where you copied your NetWare 3.12 files in Step 1.

8 To restart INSTALL, type

```
INSTALL <Enter>
```

You must reboot your server so that DOS recognizes the new partition. Pressing any key automatically reboots the server. Be sure the *System_1* diskette is in drive A:.

NOTE: Some revisions of NetWare v3.12 prompt you for a non-existent *NetWare-1* diskette. If prompted, insert the *Install* diskette instead.

9 Select "Retain Current Disk Partitions" and follow the procedures under "Name Your Server and Copy Boot Files" on page 42.

Name Your Server and Copy Boot Files

1 Name the file server.

Give the file server a unique name using these guidelines:

- The name can be from 2 to 47 characters.
- Valid characters include alphanumeric characters, hyphens, and underscores (you must use a number or letter for the first character in the name).
- The name cannot contain a period (.).
- Spaces are not allowed.

2 Assign an IPX internal network number.

An internal network number is generated randomly by INSTALL. Accept this number or enter one of your own.

To enter a number of your own, the number must be unique and it must be

- A hexadecimal number (base 16: using numbers 0 through 9 and letters A through F).
- One to eight digits.

NOTE: You can't assign an IPX internal network number of "0" or "FFFFFFFF."

For more on internal network numbers, see "IPX internal network number" in *Concepts*.

To	Do this
Accept the default number.	Press <Enter>.
Assign a new number.	Use the <Delete> key to erase each unwanted digit. Type the new number. (If you make a mistake, press <Esc>, then <Enter>, and type the number again.) Press <Enter>.

3 (Conditional) If you are installing NetWare for use with a DOS boot diskette, go to "Load Disk Driver Loadable Modules" on page 47.

4 Press <Enter> to copy the server boot files to the hard disk.

Server boot files are copied from the *System_1* or *System_2* diskettes or from the CD-ROM to a directory in the DOS partition on the hard disk.

Server boot files include SERVER.EXE (the NetWare operating system), INSTALL.NLM, disk drivers and name spaces.

4a Accept or change the default source path.

To	Do this
Copy the files from drive A:.	Continue with Step 4c.
Copy the files from a source other than the default.	Press <F2>. Type the complete drive and path. Press <Enter>.

4b

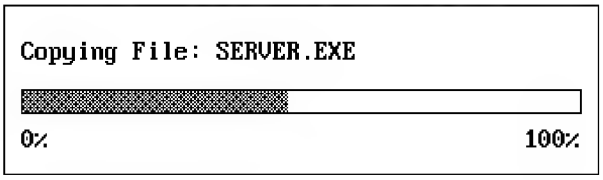
To	Do this
Copy the files to the default destination directory created for you (SERVER.312).	Continue with Step 4c.
Copy the files to a destination directory other than the default.	Press <F4>. Press <Backspace> to erase the unwanted portions of the default path. Type the new destination path. Press <Enter>. Select "Yes" and press <Enter> again.

4c Press <Enter> to begin copying.

4d (Conditional) During the copy process, insert the NetWare diskettes when prompted into the source drive and press <Enter>.

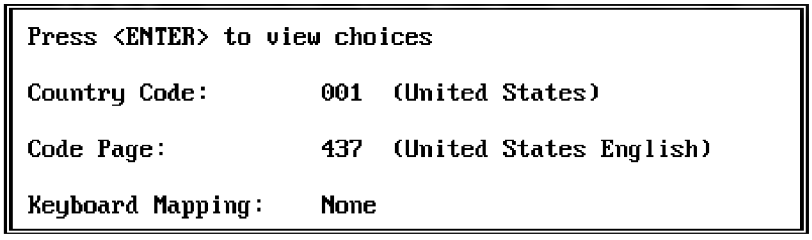
A bar graph indicates the status of the copy process:

Figure 1 Copy process bar graph



Once all files are copied, the language screen appears:

Figure 2 Language Configuration Screen



5 Enter your Country Code, Code Page, and Keyboard Mapping setting and press <F10>.

NOTE: For a list of settings for each field, highlight a field and press <Enter>, or refer to your DOS manual.

The following screen appears.

Figure 3 Select a filename format

6 Select the format for your DOS files and press <Enter>.

Selecting "NetWare Filename Format" leaves previously-saved DOS files with non-standard DOS characters as they are.

Selecting "DOS Filename Format" causes all files created from this point on to conform to DOS filename conventions.

NOTE: If you upgrade from a previous version of NetWare to NetWare v3.12, and you have files that do not conform to DOS filename format conventions, you must run VREPAIR.NLM before you can mount any volumes. VREPAIR renames invalid DOS filenames to valid DOS filenames.

If you select "DOS Filename Format," and no changes were made in the "Language Configuration" screen, press <F9> to view the character changes that will be made.

You are asked if you want to specify startup set commands.

7 Select "Yes" or "No."

Selecting "Yes" brings up a blank screen for entering the startup commands. This screen is used mainly for changing the default setting of SET AUTO REGISTER MEMORY to OFF.

Turning off SET AUTO REGISTER MEMORY allows you to load disk drivers that can't be loaded in the memory area above 16 MB.

NOTE: Changing the SET AUTO REGISTER MEMORY setting to OFF disables all memory above 16 MB. For optimal use of RAM, install a disk driver that can be loaded in the memory area above 16 MB.

The documentation that accompanied your disk driver indicates the RAM required for loading.

8 Press <F10> to save the startup commands.

9 (Optional) Add SERVER.EXE to your AUTOEXEC.BAT file.

INSTALL prompts you to add SERVER.EXE to your AUTOEXEC.BAT file. SERVER.EXE contains the NetWare v3.12 operating system.

If you choose	This happens
Yes	SERVER.EXE loads automatically when you reboot the file server. (If you're operating from a floppy disk, you'll be asked to insert the floppy disk containing the SERVER.EXE file)
No	The DOS prompt appears whenever you reboot the file server and you must type "SERVER" to load NetWare.

10 (Optional) Use the REGISTER MEMORY command to add additional memory.

If your file server is incapable of addressing memory over 16 MB, find the hexadecimal address where the memory begins and the hexadecimal length of the memory.

For example, for a machine with 32MB of RAM, type

```
REGISTER MEMORY 1000000 1000000 <Enter>
```

For more information, see "Register Memory" in Utilities Reference.

11 Continue with "Load Disk Driver Loadable Modules" on page 47.

Load Disk Driver Loadable Modules

After you create a boot diskette or a bootable disk partition for the file server, you must load the disk drivers.

Your computer system, disk drive, and controller combination determine which NetWare disk driver to load.

Procedure

1 Load the disk drivers for the controller board in your file server by typing

LOAD *disk_driver* <Enter>

Replace *disk_driver* with one of the drivers shown in the "Disk Driver" column in "Disk driver determination" on page 47.

For example, if you have an AT-type controller board, type

LOAD ISADISK <Enter>

NOTE: If you load the DCB driver for a DCB that has been used previously, you can add an option to the command line (/s=*0*) to make the driver load more quickly. The /s=*0* option disables the EEPROM test for non-existent devices.

Table 6 Disk driver determination

Type of Architecture	Controller Type	Add-On Board	Disk Driver
Industry Standard Architecture (ISA)	AT, MFM, RLL, ARLL	Built in	ISADISK
		Third-party secondary adapter	ISADISK
	ESDI		ISADISK /B
	IDE		IDE
	Novell SCSI	DCB	DCB
Microchannel	ESDI	Built in	PS2ESDI
	MFM	Built in	PS2MFM
	IBM SCSI	IBM SCSI	PS2OPT
		Built in	PS2OPT

Type of Architecture	Controller Type	Add-On Board	Disk Driver
Extended Industry Standard Architecture (EISA)	AT class	Built in	ISADISK
		See vendor	ISADISK
	EISA vendor proprietary	Built in	See vendor
		See vendor	See vendor

IMPORTANT: If you install more than one disk controller board, load the disk drivers in the order of the controller boards. Load the driver for the internal controller first, the driver for the first disk controller board second, and so forth.

IMPORTANT: If you do not follow the correct order, system messages about your hard disks will be incorrect. For more information, see "Device Numbering" in *Concepts*.

1. (Conditional) On ISA and IDE file servers, answer the prompt for the I/O port address and interrupt number.
2. (Conditional) On microchannel or EISA file servers, confirm the slot number for the network board.
3. If you have external disk subsystems that use the DCB disk driver or other disk drivers that require DISKSET, go to "Run DISKSET (Optional)" on page 49. If you do not need to run DISKSET, go to "Create NetWare Disk Partition Tables" on page 52.

Run DISKSET (Optional)

Use DISKSET only with ADIC/Novell DCB disk drivers or with a third-party driver if the manufacturer requires you to use DISKSET.

DISKSET places identification information about external hard disks on the EEPROM of a Disk Coprocessor Board (DCB) or its third-party equivalent.

The ID information on the EEPROM allows the disks to communicate through the DCB to the file server.

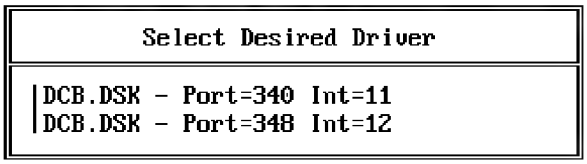
Procedure

1. To run DISKSET, type

   DISKSET <Enter>

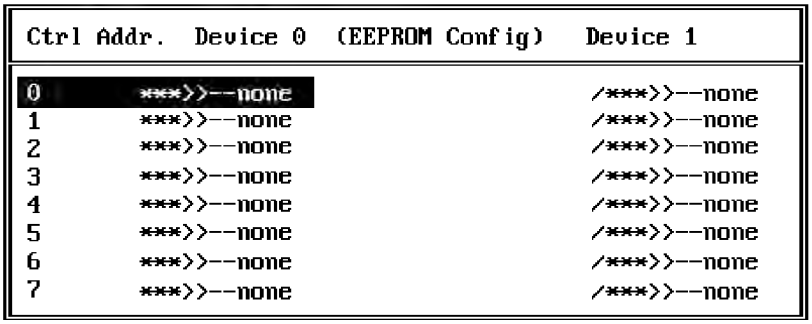
2. Select "Disk Coprocessor Board Setup" from the "Diskset Options" menu.
3. Select the disk driver and settings that match external hard disk 0 (physical device 0 attached to the controller) on the "Select Desired Driver" list:

Figure 4 Select Desired Driver



4. On the "EEPROM Config" screen, highlight the text "***>>–none" under the "Device 0" heading next to the appropriate controller address:

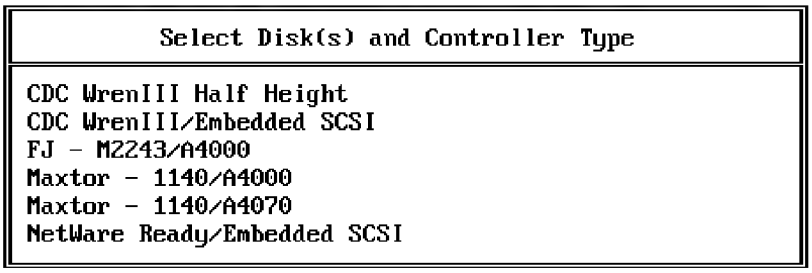
Figure 5 EEPROM Config Screen



5 Press <Ins>.

6 Scroll through the "Select Disks and Controller Type" list and select the name of the hard disk you are setting up:

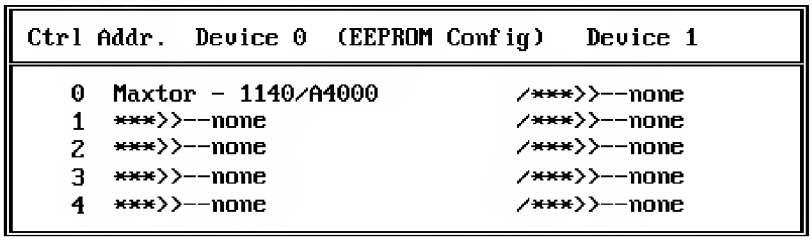
Figure 6 Select Disks and Controller Type



NOTE: If you have a NetWare-ready hard disk, select "NetWare Ready/ Embedded SCSI."

After you select the hard disk, the "EEPROM Configuration" screen looks similar to the following:

Figure 7 EEPROM Screen

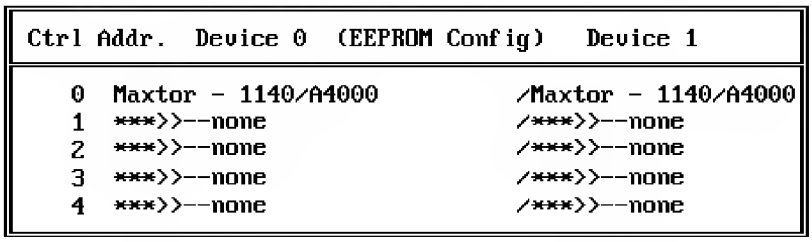


7 (Conditional) If you have a second hard disk attached to the same controller, move to the "/ ***>>__none" text under the "Device 1" heading (for physical device 1), and press <Ins>.

8 Scroll through the "Select Disk(s) and Controller Type" list, and select the name of the hard disk.

After you select the hard disk, the "EEPROM Configuration" screen looks similar to the following:

Figure 8 EEPROM Screen



9 Save the information by pressing <Esc> and answering "Yes" at the prompt.

10 To configure the remaining hard disks for your file server, repeat Step 4 through Step 9.

For more information, see "DISKSET" in *System Administration*.

11 Continue with "Create NetWare Disk Partition Tables" on page 52.

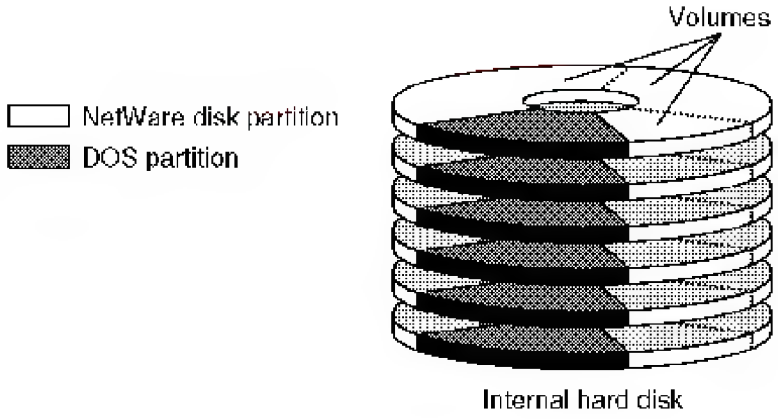
Create NetWare Disk Partition Tables

Once the disk drivers have been loaded, use INSTALL.NLM to create a NetWare partition on the hard disk.

One internal hard disk can contain an active DOS partition and a NetWare partition. External hard disks can have only NetWare partitions. Network volumes are created on NetWare partitions.

"Hard disk partitions" on page 52 illustrates hard disk partitions:

Figure 9 Hard disk partitions



Procedure

1. Load INSTALL by typing

   LOAD *path* INSTALL <Enter>

   Replace *path* with the directory path to INSTALL.NLM. For example:

   LOAD C: INSTALL <Enter>

   This loads the INSTALL.NLM from the server boot directory.
2. From the "Installation Options" menu, select "Disk Options."
3. From the "Available Disk Options" menu, select "Partition Tables."
4. If you have more than one disk, select the disk you need to partition from those listed on the "Available Disk Drives" menu.

You may have other DOS or NetWare partitions on your hard disk (apart from the primary DOS boot partition created earlier).

If you want NetWare to use the space, delete the old partitions before creating a new NetWare v3.12 partition. To complete the task, select "Delete Partition" from the "Partition Options" menu.

WARNING: Deleting a partition deletes all data. To delete existing partitions, (don't delete the DOS partition you created in Step 3 on page 25) make sure you have a backup of the data prior to following these procedures.

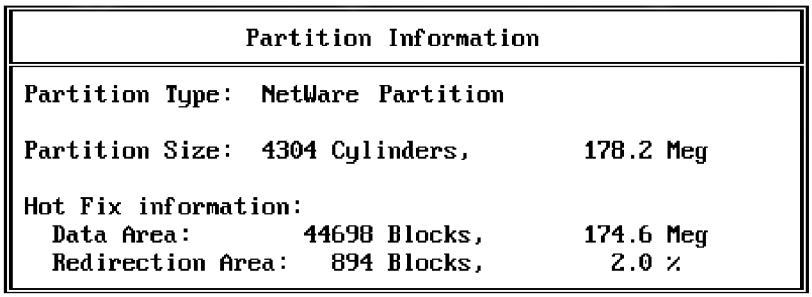
5 From the "Partition Options" menu, select "Create NetWare Partition."

NetWare allows only one NetWare partition per disk. Therefore, if the disk has more than one free partition area, select an area for the NetWare partition. NetWare allocates

- The marked free partition area as a NetWare partition.
- 98% of the space available as a data area.
- 2% of the space for the Hot Fix redirection area.

This information is displayed on the "Partition Information" screen. The screen shows the space on the NetWare partition, the blocks allocated to the data area, and the redirection area:

Figure 10 Partition Information



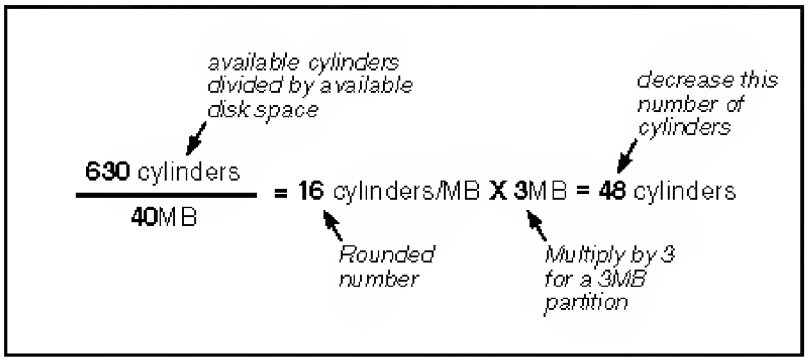
For more information, see "Hot Fix" in *Concepts*.

6 Accept or decrease the NetWare partition size and press <Enter>.

If you don't want to use the whole partition for NetWare, decrease the partition size by entering a smaller number of cylinders in the "Partition Size" field.

To determine the number of cylinders to decrease, divide available cylinders by available disk space; then multiply that number by the number of megabytes of disk space you want in the partition:

Figure 11 Formula for decreasing the number of cylinders



7 Accept or change the size of the data area or the Hot Fix redirection area and press <Enter>.

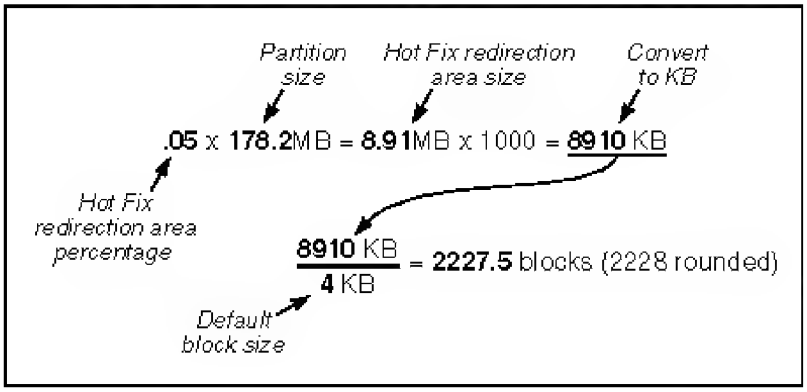
NOTE: If you have a NetWare-ready hard disk, ignore the free space left on the hard disk and continue with Step 8.

Move the cursor to one of the fields and enter the number of new blocks in that field. NetWare calculates the remaining space in the other field.

You can enter a fixed percentage of the disk partition as a redirection area by multiplying the percentage by the partition size, dividing that sum by 100, multiplying that by 1000, and then dividing it by the block size (the default block size is 4 KB).

For example, if you had a 178.2MB partition and wanted to set aside 5% as a redirection area, you would calculate it as follows:

Figure 12 Formula for determining a fixed percentage of disk space



8 Press <Esc> and select "Yes" at the prompt to create the partition.

9 If you have more than one disk, press <Esc> to return to the "Available Disk Drives" menu. Select the next disk to partition.

Repeat Step 6 through Step 9 for each disk.

10 Press <Esc> to return to the "Available Disk Options" menu.

11 To mirror or duplex your file server's NetWare partitions, go to "Mirror or Duplex the Disk (Optional)" on page 56. Otherwise, press <Esc> and go to "Create Volume SYS:" on page 59.

NOTE: (Optional) You may want to conduct a *surface test* to check for bad blocks (select "Surface Test" on the "Available Disk Options" menu).

The surface test runs in the background so you can do work on other disks while the test is running. In most cases, Hot Fix redirects bad blocks as it finds them if you choose not to run the surface test.

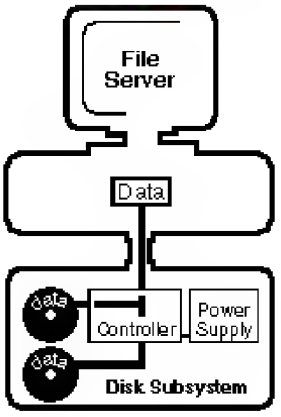
Mirror or Duplex the Disk (Optional)

To protect data against the failure of a hard disk or a hard disk controller, NetWare can make exact duplicates of the same NetWare partition on two separate hard disks.

If hard disks are connected to the same hard disk controller, the process is called *mirroring*. However, mirroring doesn't protect against the failure of a hard disk controller.

"Disk mirroring" on page 56 illustrates disk mirroring:

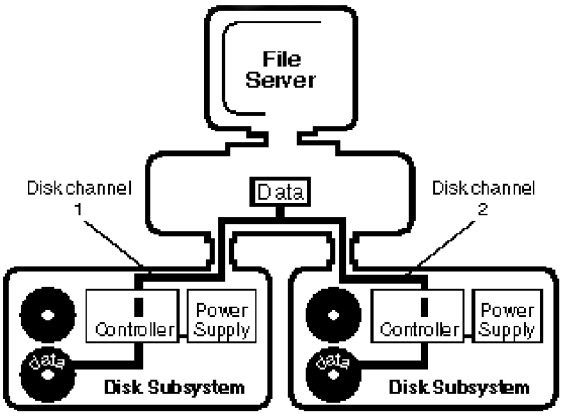
Figure 13 Disk mirroring



If NetWare partitions are duplicated over two or more hard disk controllers, the process is called *duplexing* and is a more effective way to protect data.

"Disk duplexing" on page 57 illustrates disk duplexing.

Figure 14 Disk duplexing



For more information, see "Disk Duplexing" or "Disk Mirroring" in *Concepts*.

NOTE: Even though your hard disks may be mirrored or duplexed, perform a regular backup of your hard disks at least once a week.

Procedure

1. To mirror or duplex partitions on two or more hard disks, select "Mirroring" from the "Available Disk Options" menu.

   Secondary partitions (up to 15 hard disks that can be mirrored or duplexed to the first, or *primary* hard disk) must have partition sizes equal to or greater than the primary partition.

2. Select the primary logical partition to be mirrored or duplexed on the "Partition Mirroring Status" screen:

Figure 15 Partition Mirroring Status

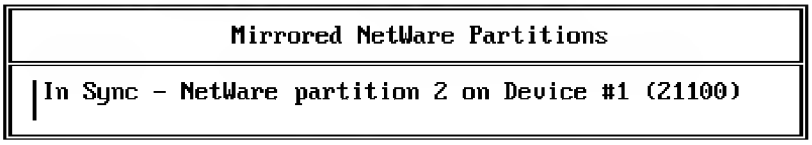
```
Partition Mirroring Status

Not Mirrored: Logical Partition #1
Not Mirrored: Logical Partition #2
Not Mirrored: Logical Partition #3
```

For more information on logical partitions, see "Device Numbering" in *Concepts*.

3 Press <Ins> on the "Mirrored NetWare Partitions" screen:

Figure 16 Mirrored NetWare Partitions



4 Select the secondary partition to be mirrored or duplexed with the primary partition on the "Available Partitions" screen:

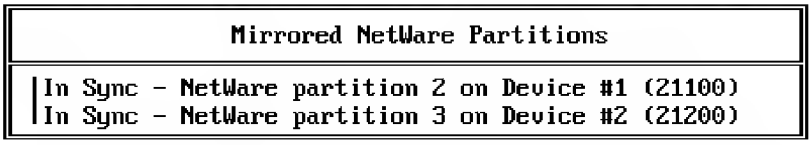
Figure 17 Available Partitions

NOTE: If the secondary partition is larger than the primary partition, a screen appears to warn you that the mirrored or duplexed partition will be the size of the smaller partition.

Press <Esc> to remove the warning screen and select "Yes" at the prompt to make the NetWare partitions equal.

The mirrored or duplexed partitions look similar to the following:

Figure 18 Mirrored NetWare Partitions



5 Press <Ins> to mirror or duplex additional hard disks to the primary hard disk.

6 Go to "Create Volume SYS:" on page 59.

Create Volume SYS:

With NetWare v3.12, your file server can have from 1 to 64 volumes. Your NetWare partition must have a SYS: volume for storing the SYSTEM, PUBLIC, LOGIN, and MAIL directories.

You may also want to create a volume for applications and data. If the bindery on volume SYS: becomes corrupted and can't be fixed with BINDFIX, you can rename the corrupted volume and create a new volume SYS:. Then you can go into the renamed volume and delete the old bindery files.

The highest performance configuration spans a single volume over many hard disks that supports DOS name spaces only.

When spanning single volumes over hard disks, we strongly recommend that you duplex every hard disk. See "Disk Duplexing" in *Concepts*.

If your network includes workstations using an operating system that allows long filenames (such as Macintosh workstations), create a separate volume for each name space.

Long filenames take up more disk space than DOS filenames. Creating separate volumes for each filename type helps optimize disk space use and isolates network problems more easily.

Procedure

1. From the "Installation Options" menu, choose "Volume Options."
2. Press <Ins> on the "Volumes" screen.

   If you have more than one hard disk (listed as a "Logical Partition"), select one to place the first volume on from those listed on the "Free Space Available For Volume Segments" screen.

   NetWare automatically enters volume SYS: as the first volume on the "New Volume Information" screen. Its default size is the entire partition.
3. (Optional) To create more than one volume, enter the size of volume SYS: in the "Initial Segment Size" field.

   The hard disk space not allocated for volume SYS: is then available for additional volumes.

   IMPORTANT: To change the block size for volume SYS:, follow the procedures under "Changing the Block Size (Optional)" on page 60 before continuing with Step 4.

4. Press <Esc> and answer "Yes" at the "Create Volume?" prompt to create volume SYS:.
5. (Optional) Create additional volumes by repeating Step 2 through Step 4.

   NOTE: When creating volumes other than SYS:, you are required to enter a volume name.
6. (Optional) To change the block size, continue with "Changing the Block Size (Optional)" on page 60 Otherwise, press the Down-arrow key and determine whether you want to create additional volumes on external hard disks by reading "Creating Additional Volumes on External Disk Subsystems (Optional)" on page 63.

Changing the Block Size (Optional)

In NetWare v3.12, the default block size is 4 KB, or 4096 bytes of data. While creating volume SYS:, you can change the block size to 8, 16, 32, or 64 KB. Block size is the same on all segments of a volume.

There are advantages to using small or large block sizes.

Small block sizes need more file server memory to track the FAT and directory tables; however, if you have many small files, less hard disk space is wasted by partially-filled blocks.

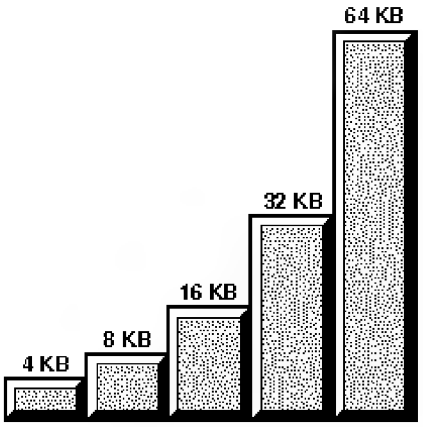
Larger block sizes are best for large database records.

Procedure

1. With volume SYS: displayed in the "Volumes" screen, press <Enter> to get the "Volume Block Size" screen.
2. Press the Down-arrow key to advance to the "Volume Block Size" field; then press <Enter> for a list of block size options.

   "Available block sizes" on page 61 shows available block sizes.

Figure 19 Available block sizes



NOTE: Selecting large block sizes (32 KB or 64 KB) can cause some DOS utilities to calculate the amount of free hard disk space incorrectly.

3 (Optional) Press <Enter> to make changes to the initial segment size.

IMPORTANT: To have more than one volume on a hard disk, enter a lower number for the "Initial Segment Size" to accommodate other volumes.

Initially, NetWare assigns the entire partition as one volume segment.

If a volume is contained entirely on one hard disk, the file server can only perform a certain number of reads and writes to that volume per second.

However, if the volume spans two, three, or four hard disks, the file server can perform two, three, or four times as many reads and writes to the volume per second.

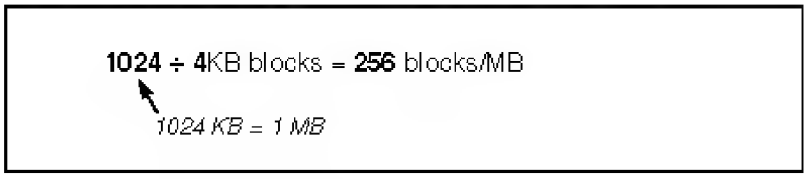
Use these rules to determine whether to make changes:

- One hard disk can have up to 8 volume segments (non-contiguous storage spaces) per disk.
- A volume can have up to 32 volume segments.
- One volume can span 32 hard disks if each disk contains one volume segment.
- Volume size can be increased but never decreased.
- If you add hard disks to a disk subsystem, you can increase the volume size without bringing down the file server.

- To add an internal hard disk to increase the volume, you must first bring down the server.
- On a volume spanning several hard disks, if one hard disk goes down, the entire volume goes down (unless that hard disk is mirrored or duplexed).

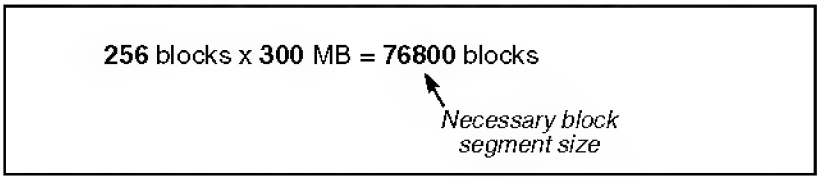
Determine the size of the volume segment by dividing 1024 by the block size. The result is blocks per megabyte:

Figure 20 Formula for determining blocks per megabyte



Multiply the number of blocks per megabyte by the available disk space (in megabytes) you want to allocate. The result is the necessary block segment size:

Figure 21 Formula for determining block segment size



HINT: Set the size of volume SYS: between 60 and 100 MB, depending on your needs and your hardware configuration.

4. Press <Esc> and answer "Yes" at the "Create Volume?" prompt to change the block size.
5. (Conditional) If you changed the block size for a volume (such as volume SYS:), finish creating the volume by returning to Step 4.

6 To create additional volumes on an external disk subsystem, continue with "Creating Additional Volumes on External Disk Subsystems (Optional)" on page 63 Otherwise, go to "Mount Volumes" on page 64.

Creating Additional Volumes on External Disk Subsystems (Optional)

If your NetWare v3.12 file server uses external hard disks you can choose to make the additional hard disks separate volumes.

Procedure

1 From the "New Volume Information" screen, press <Esc> until the "Insert" option is enabled.

2 Press <Ins> on the "Volumes" screen.

If you have more than one hard disk (listed as a "Logical Partition"), select one to place the first volume on from those listed on the "Free Space Available For Volume Segments" screen.

3 (Optional) To have more than one volume on the external hard disk, enter the volume size in the "Volume Segments" field.

Hard disk space not allocated for the new volume is available for additional volumes.

NOTE: To change the block size for volumes on external disk subsystems, follow the procedures under "Changing the Block Size (Optional)" on page 60 before continuing with Step 4.

4 Press <Esc> and answer "Yes" at the "Create Volume?" prompt to create the new volume.

5 (Optional) Create additional volumes on the hard disk by repeating Step 2 through Step 4.

6 Continue with "Mount Volumes" on page 64.

Mount Volumes

Once you create volumes, you must mount them, one at a time.

Procedure

1. Select the volume to mount from the "Volumes" list.

   Since volume SYS: was created first, it is highlighted.

2. Press the Down-arrow key to highlight the "Status" field.

3. Press <Enter> and select "Mount Volume."

4. To mount other volumes, press <Esc> and repeat Step 1 through Step 3.

   WARNING: If you are installing from CD-ROM and the CD-ROM reader is cabled to the same SCSI controller as the hard disk containing volume SYS:, your server may lock up during installation.

5. If volume SYS: and your CD-ROM reader share the same SCSI controller, follow the procedures under "Mounting a CD-ROM as a NetWare Volume (Conditional)" on page 64 If not go to "Copy SYSTEM and PUBLIC Files" on page 65.

Mounting a CD-ROM as a NetWare Volume (Conditional)

To mount the CD-ROM reader as a NetWare volume and avoid SCSI device conflicts, follow the procedures below.

1. Press <Alt> <Esc> until you are at the console prompt (:).

2. Type

   ```
   DOWN <Enter>
   ```

3. Then type

   ```
   EXIT <Enter>
   ```

4. Using a text editor, remove the CD device drivers from your CONFIG.SYS file.

5. Save the updated CONFIG.SYS file.

6. Using a text editor, remove any references to the CD drivers from your AUTOEXEC.BAT file.

7. Save the updated AUTOEXEC.BAT file.

8. Reboot the server by pressing <Ctrl> <Alt> <Del>.

9 (Conditional) If the server doesn't boot automatically from the AUTOEXEC.BAT file, change to the subdirectory with your SERVER.EXE and other boot files, and type

```
SERVER <Enter>
```

10 (Conditional) If you are using ASPI device drivers (for example, for an Adaptec controller), you need to load one of the following disk drivers

- ASPICD.DSK
- CDNASPI.DSK

11 At the console, type the following

```
LOAD C:CDROM.NLM <Enter>CD MOUNT NETWARE_312
<Enter>
```

12 At the console, type the following

```
LOAD C:INSTALL <Enter>
```

13 Continue with "Copy SYSTEM and PUBLIC Files" on page 65.

Copy SYSTEM and PUBLIC Files

INSTALL copies the NetWare utility files into the file server's SYS:PUBLIC and SYS:SYSTEM directories.

To	Do this
Install the SYSTEM and PUBLIC files from drive A:.	Continue with Step 1.
Install the SYSTEM and PUBLIC files from a source other than drive A:.	Follow the procedures under "Copy SYSTEM and PUBLIC Files from CD or a Network Directory" on page 66

Copy SYSTEM and PUBLIC Files from Floppy Diskettes

Procedure

1 From the "Installation Options" menu, select "System Options."

2 Select "Copy System and Public Files" from the "Available System Options" menu.

3 Insert the *Install* diskette and press <Enter>.

4 Follow the prompts for the other diskettes.

Press <F5> to skip a diskette. For more information, see "Install" in *System Administration*.

NOTE: Depending on your version of DOS and your server speed, the *Unicode* diskette may require anywhere from 30 to 60 minutes to install. This is because approximately 147 files must be copied to three different locations.

5 Continue with "Load LAN Drivers" on page 66.

Copy SYSTEM and PUBLIC Files from CD or a Network Directory

Procedure

1 From the "Installation Options" menu, select "System Options."

2 From the "Available System Options" menu, select "Copy System and Public Files."

3 Press <F6>.

4 Specify the drive (or directory) that contains the files.

For example, type

```
D:\NETWARE.312\ENGLISH <Enter>
```

Or, if the CD-ROM reader is mounted as a NetWare volume on this server, type

```
NETWARE_312:NETWARE.312\ENGLISH
```

5 Press <Esc> twice and select "Yes" to exit INSTALL and get to the console prompt.

6 Continue with "Load LAN Drivers" on page 66.

Load LAN Drivers

Once the SYSTEM and PUBLIC files are copied, continue the installation process by loading LAN drivers.

Select LAN drivers for the cabling system and the network boards you use.

Frame Types for Ethernet Networks

The default Ethernet frame type for NetWare v3.12 is 802.2.

If you have a mixed environment where you have NetWare v3.11 or earlier that use the 802.3 frame type, you may need to specify both 802.2 and 802.3 frame types.

To do this, you load the LAN driver twice and specify a different frame type each time the LAN driver is loaded.

A workstation running the 802.3 frame type can't communicate with the NetWare v3.12 server (which defaults to 802.2) until both frame types are loaded.

IMPORTANT: Some routers may not support the Ethernet 802.2 frame type. Check your router's documentation and load the frame type the router supports.

IMPORTANT: Loading both 802.2 and 802.3 frame types can affect network speed and performance. Standardize your network on 802.2 if possible.

Procedure

1 Load the drivers with the default frame type.

```
LOAD LAN_driver <Enter>
```

"LAN driver identification" on page 68 lists the drivers supported by Novell, Inc.

Third-party drivers are also included with NetWare v3.12, including drivers from 3COM®, Cabletron, Datacom, Hewlett Packard®, IBM, Intel®, Madge, Proteon®, Racal, Standard Microsystems, Thomas-Conrad, and Ungermann-Bass®.

The LAN drivers are copied to SYS:SYTEM and can be loaded from there.

1a (Conditional) If you are loading a Novell-supplied LAN driver, replace *LAN_driver* with the driver listed in "LAN driver identification" on page 68 for your cabling system and network board.

1b (Conditional) If you are loading a third-party LAN driver, load the driver from SYS:SYSTEM or from the diskette that came with the network board.

Table 7 LAN driver identification

Cabling System	Network Board	Driver
ARCnet	RX-Net RX-Net II RX-Net/2	TRXNET
Ethernet	NE/2 NE/2T	NE2
	NE2-32	NE2_32 (replaces NE2-32)
	NE1000 - ASSY 950-054401 NE1000 - ASSY 810-160-001	NE1000
	NE2000 - ASSY 810-149 NE2000T - ASSY 810-000220	NE2000
	NE2100 - ASSY 810-000209	NE2100
	NE1500T	NE1500T
	NE3200	NE3200
	NE32HUB	NE32HUB
Token-Ring	NTR2000	NTR2000

For example, if you have an Ethernet cabling system and an NE2000 network board, type

```
LOAD NE2000 <Enter>
```

2. Answer the prompts for addresses and interrupts according to the information you entered on the File Server Worksheet.
3. (Conditional) Load the drivers with another frame type. Type

```
LOAD LAN_driver FRAME=frame_type <Enter>
```

Replace *frame_type* with the frame type listed in "Frame type" on page 69 for your cabling system and network board.

Table 8 Frame type

Cabling System	Frame Type	Explanation
ARCnet	Novell_RX-NET	Default. Use on networks connected by ARCnet cabling.
Ethernet	ETHERNET_802.2	Default. Assigns the IEEE and OSI standard frame type. Required for networks using NCP security signature.
	ETHERNET_II	Assigns a unique packet header (type code). Use on networks connected to DEC computers or to computers using the TCP/IP protocol.
	ETHERNET_802.3	Assigns the Novell IPX frame. Use on an existing network that only uses the 802.3 frame type.
	ETHERNET_SNAP	Use when the 802.2 SNAP extension is required.
Token ring	TOKEN-RING	Default. Assigns the standard packet header 802.2. Use only with protocols that require 802.2 encapsulation (such as the OSI protocol suite).
	TOKEN-RING_SNAP	Assigns the 802.2 with SNAP header. Use with networks that need to communicate with protocols such as AppleTalk and TCP/IP.
IBM PC Network	IBM_PCN2_802.2	Default. Use on networks connected by PC network cabling.
	IBM_PC2N2_SNAP	Use when the 802.2 SNAP extension is required.

For example, if you have an Ethernet cabling system and an NE2000 network board, type

```
LOAD NE2000 FRAME=ETHERNET_802.3 <Enter>
```

If the LAN driver has been loaded previously, a message similar to the following appears:

```
Do you want to add another frame type for a
previously loaded board? n
```

4. Type "Y" to continue.
5. Select the correct frame type from the confirmation list.

   The following message appears:

   ```
   Previously loaded module was used re-entrantly
   ```

   For more information, see "Load LAN Driver" in *System Administration*.

Bind the Protocol to the LAN Driver

The final installation step is to bind the protocol to the LAN driver.

NetWare v3.12 allows protocols other than IPX to function on the network. The steps below use IPX as an example protocol to bind each LAN driver in the file server.

Procedure

1. Bind IPX to the LAN driver.

   1a. To bind IPX to each LAN driver, type

   ```
   BIND IPX TO LAN_driver
   ```

   If you use multiple frame types on the same network board, NetWare v3.12 lists the frame types that are loaded and asks you to select the board you want to bind IPX to.

   You can bind IPX to all those frame types, as long as you give a different network address to each frame type.

   For more on network numbers, see "Network numbering" in *Concepts*.

   1b. If you have loaded the same LAN driver several times (for several network boards of the same type), select the board to be bound to the protocol.

   1c. To bind a protocol to a driver that is loaded with two or more frame types for the same network board, see "BIND" in *System Administration*.

2. Assign the network address.

   Each LAN driver must be assigned the network address that identifies the cabling system it uses to communicate with similar LAN drivers on the network.

NOTE: This network address is *not* the same as the internal IPX network number you assigned to the file server in Step 2.

At the prompt, type the number that enables the LAN driver and network board in the file server to communicate with the network. The address must be

- A hexadecimal number (base 16: using numbers 0 through 9 and letters A through F).
- One to eight digits.

  NOTE: If you use multiple frame types with your LAN drivers, assign a network address for each frame type.

For more on internal network numbers, see "Network numbering" in *Concepts*.

NetWare v3.12 is now installed. However, you must still create STARTUP.NCF and AUTOEXEC.NCF files. These files are necessary to boot the file server.

3 Continue with "Create File Server NCF Files" on page 71 to create the STARTUP.NCF and AUTOEXEC.NCF files.

Create File Server NCF Files

Create a STARTUP.NCF file

A STARTUP.NCF file contains commands to load disk drivers and name space support for your file server.

This file is executed after you run SERVER.EXE, and is stored on the disk you boot from (hard disk or diskette).

Once STARTUP.NCF loads disk drivers and name space support and mounts volume SYS:, it turns control over to AUTOEXEC.NCF to complete the boot process.

Procedure

1. (Conditional) If you use a boot diskette to boot your file server, make sure the boot diskette is in drive A:.
2. Load INSTALL by typing

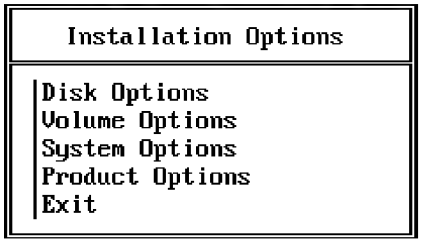
   LOAD INSTALL <Enter>
3. From the "Installation Options" menu, select "System Options."
4. From the "Available System Options" menu, select "Create STARTUP.NCF File."
5. On the "Path For STARTUP.NCF File" screen, enter the proper drive letter.

   Make sure the drive is set to

   - C: if you boot from hard disk.
   - A: if you boot from drive A:.
6. Press <Enter>.

   A screen similar to the following appears:

Figure 22 A sample STARTUP.NCF file



   The operating system reads the previously-entered disk driver and name space support from memory.
7. Determine your system configuration and, from the following table, decide which additional commands you would like added to the STARTUP.NCF file. Type one command per line.

To	Add these or other commands
Load name spaces for Macintosh, OS/2, UNIX, or FTAM	LOAD MAC.NAM LOAD OS/2.NAM LOAD NFS.NAM LOAD FTAM.NAM (These commands must precede the command to mount the volume that stores the files using the name space.)
Set server parameters	(You can add the following seven commands to the STARTUP.NCF file only. You can add other SET commands to the STARTUP.NCF or to the AUTOEXEC.NCF file.) SET Maximum Physical Receive Packet Size SET Cache Buffer Size SET Reserved Buffers Below 16 Meg SET Maximum Subdirectory Tree Depth SET Concurrent Remirror Requests SET Auto TTS Backout Flag SET Minimum Packet Receive Buffers (For more on these and other SET parameters, see "SET" in *System Administration*, or type "SET" at the server console.

8 Press <Esc> to save the file.

To unload INSTALL utility	Press <Esc> until you get the exit prompt. Select "Yes."
To keep INSTALL loaded	Press <Alt><Esc> to move to a different console screen.

Create an AUTOEXEC.NCF File

An AUTOEXEC.NCF file contains commands to complete the boot process after SERVER.EXE and STARTUP.NCF execute.

Because AUTOEXEC.NCF is saved in and runs from SYS:SYSTEM, place most boot commands (except the disk driver and name space support commands) in AUTOEXEC.NCF.

Commands you can use in AUTOEXEC.NCF do the following:

- Name the file server.
- Assign the server's internal network number.
- Load LAN drivers for the server and assign the network number.
- Bind LAN drivers to the server's registered protocol.

- Load other modules you want loaded when the server boots. (See "LOAD" in *System Administration.*)
- Execute other console commands (such as TRACK ON or VOLUMES) during the boot process.
- Set other parameters for the server. (See "SET" in *System Administration.*)
- Mount volumes.

Procedure

1. From the "Available System Options" menu, select "Create AUTOEXEC.NCF File."

   The operating system reads the previously-entered disk driver and name space support from memory.

   A screen similar to the following appears, showing the commands that are automatically placed in AUTOEXEC.NCF.

Figure 23 A sample AUTOEXEC.NCF file

```
file server name SPEEDY
ipx internal net 1993ABCD
LOAD NE1000 port=300 int=3
bind IPX to NE1000 net=DEADBEAF
mount all
```

NOTE: When using the 802.3 frame type, rather than the 802.2 default, the screen shown above displays the frame type number.

If you load multiple LAN drivers, your AUTOEXEC.NCF file is different. See "INSTALL" in *System Administration*.

2. (Optional) From the table below, choose which of the more common commands to include in AUTOEXEC.NCF.

To	Add these commands
Create disk partitions, create volumes, format a hard disk, etc.	LOAD INSTALL
View network operation information.	LOAD MONITOR
Automatically lock the console at the time the server is booted.	LOAD MONITOR L
Load the print server on the file server and establish print services.	LOAD PSERVER *print_server*
Correct volume problems or remove name space entries from File Allocation and directory tables.	LOAD VREPAIR

3 (Optional) From your system configuration, choose additional loadable modules to include in AUTOEXEC.NCF.

Additional module types are shown in the table below.

Module Type	Module Name
Equipment	UPS.NLM
Remote Console	REMOTE.NLM RSPX.NLM RS232.NLM
Remote Boot for Token-Ring	RPL.NLM
Remote boot for IBM and Western Digital on Ethernet	RPL.NLM
Third-party loadable modules	(See third-party documentation)

NOTE: If you use an uninterruptible power supply, see "UPS" in *System Administration* for troubleshooting tips.

Some loadable modules need other loadable modules to function. If the prerequisite module is not loaded first, the operating system looks at your default drive and then at SYS:SYSTEM and automatically loads the necessary module.

4 From the table below, decide if you want any of the following console commands to include in AUTOEXEC.NCF.

To	Add these commands
Implement security measures	SECURE CONSOLE
Display the processor speed	SPEED
Mount Volumes	MOUNT VOL1 (or other volume name) MOUNT ALL *Note:* Volume SYS: is mounted automatically when its disk driver is loaded during the STARTUP.NCF file's execution.
Bind protocols other than IPX to the LAN drivers.	BIND IP to... See "Bind" in *Utilities Reference*.
Set server parameters.	SET commands (see "SET" in *Utilities Reference).*
Pause after each command.	PAUSE PAUSE allows you to read system messages displayed after the operating system executes a command.

5 (Conditional) Decide whether to allow unencrypted passwords.

If you have workstations using NET3.COM or NET4.COM shells, or existing servers using NetWare 2.1x utilities on the network, allow unencrypted passwords by typing the following

```
SET ALLOW UNENCRYPTED PASSWORDS=ON <Enter>
```

6 Press <Esc> to save the file.

NOTE: The SET parameter to allow unencrypted passwords will not take effect until the server has been rebooted.

To avoid rebooting, you may want to enter the SET command at the console prompt.

7 Go to "Follow Up After File Server Software Installation" on page 77.

Follow Up After File Server Software Installation

Once the STARTUP.NCF and AUTOEXEC.NCF files have been created, complete the following tasks that apply to your network configuration.

Procedure

1. Add name space support to the volume.

   If your network includes workstations that use an operating system that supports long filenames, use the ADD NAME SPACE command to add the name space to the volume. At the console prompt, type

   ADD NAME SPACE *name_support* TO VOLUME *volume_name* <Enter>

   Use this command for every volume that stores files using non-DOS naming conventions.

   For example, if you have a volume named MAC for Macintosh files, type

   ADD NAME SPACE MACINTOSH TO VOLUME MAC <Enter>

   Then add the command to your AUTOEXEC.NCF file.

2. Add Macintosh support.

   To store Macintosh files and folders on a NetWare v3.12 file server, install NetWare for Macintosh (a separate Novell product) on your file server.

   This product provides native-mode support for Macintosh workstations that connect to the server.

3. Lock your file server keyboard.

   To prevent others from tampering with the file server, load MONITOR and select "Lock file server console" from the "Available Options" menu.

   For additional security tips, see "Secure Console" in *System Administration*.

4. Prepare for power fluctuations.

   If you do not have a UPS attached to your file server, be prepared to

   - Run VREPAIR from either the DOS partition on the hard disk or diskette. Power outages can corrupt File Allocation Tables and directory tables.

- Make at least daily backups to protect your data. Power outages can destroy a volume.
- Make an additional backup of the bindery on a diskette. Sometimes third-party backup devices do not back up the bindery.
- Run BINDFIX. Power outages can corrupt the bindery. Restore the bindery from a backup if BINDFIX doesn't work.

5 Update all workstation shells or VLMs.

See Workstation Basics and Installation.

6 Further customize the configuration.

Read about the following commands in *System Administration*:

"INSTALL"	Performs installation tasks, including creating disk partitions, creating volumes, formatting a hard disk, etc.
"MONITOR"	Locks the file server console and shows how efficiently your network is operating.
"SET"	Displays operating system parameters and configures the operating system to fit your situation.
"SPEED"	Displays the processor speed rating (see "Speed" in *System Administration*).
"SPOOL"	Creates, changes, or displays spooler mappings.

Copy NetWare v3.12 Utilities to NetWare v2.x Servers

This ensures compatibility between NetWare v3.12 servers and NetWare v2.1x servers on the same network.

Procedure

1 Log in to the NetWare v2.x file server.

2 Flag the NetWare v2.x utilities Normal. In the SYS:LOGIN and SYS:PUBLIC directories, type

```
FLAG *.* N <Enter>
```

3 Map a drive to volume SYS: on the NetWare v3.12 file server by typing

```
MAP Q:=fileserver/SYS:PUBLIC <Enter>
```

Replace *Q* with a letter not being used and *fileserver* with the name of the NetWare v3.12 file server.

4 Enter your username and password for the NetWare v3.12 file server.

5 Copy the NetWare v3.12 utilities from the SYS:PUBLIC and SYS:LOGIN directories to the same directories on the NetWare v2.x file server.

6 Flag the new utilities on the NetWare 2.x file server Shareable, Read Only by typing

```
FLAG *.* S RO <Enter>
```

7 (Conditional) If all workstations are running the latest requestors (VLMs) or shells (NETX), remove the SET parameter allowing for unencrypted passwords from the AUTOEXEC.NCF file.

You created this SET parameter in Step 5.

NOTE: The SET parameter to allow unencrypted passwords will not take effect until the server has been rebooted.

To avoid rebooting, you may want to enter the SET command at the console prompt.

Troubleshooting

Hard disk

If you cannot access a hard disk, check

- The cables between the hard disks and the controllers. Ensure pin 1 of each cable is attached to pin 1 of each connector.
- The power cables to make sure they are properly attached.
- The DCB jumper settings.
- The addresses of the controllers to ensure that all are valid.

Volume errors

If you get disk errors when mounting a volume, check the memory in the file server by loading MONITOR. You should have 20% or more available cache buffers.

Communication problems

If the file server can't communicate with the rest of the network, check to see that

- Each network board is properly seated.
- The cable is properly connected.
- All cabling is properly terminated.
- The internal network number of the file server does not conflict with other file server internal network numbers or other network addresses.
- All servers and workstations use the same frame type.

For more help, see "Troubleshooting Guide" in *System Administration*.

Where to Go from Here

To	See
Continue installing	"Set up the Network" on page 83.
Install cabling	The documentation that comes with your network boards.
Install a print server	Print Server
Set up workstations to run a remote file server console	"Remote Management" in *System Administration.*
Set up diskless workstations	The related client manual: Workstation for DOS and Windows Workstation Basics and Installation Workstation for OS/2
Run NetWare v3.12 Utilities on a NetWare v2.x server	Utilities Reference
Install a DOS workstation	Workstation Basics and Installation
Install a Windows workstation	Workstation for DOS and Windows
Install an OS/2 workstation	Workstation for OS/2

5 Set up the Network

This section provides guidelines for planning and creating your network environment, creating your directory structure, setting up users, and providing network security.

Make your initial setup simple. Your network will evolve as you find solutions specific to your needs.

Record the planning decisions you make on the worksheet found in the back of the manual.

Necessary Resources

To plan and create your network environment, you need the following:

- A workstation to which you are logged in as SUPERVISOR to create directories and users (see Workstation Basics and Installation).
- Copies of the following worksheets found in the back of the manual:

  Users Group User Defaults Trustee Directory Security Trustee File Security

Plan the Directory Structure

Use the "Directory Structure" portion of the Directories Worksheet as you complete this section.

The four directories listed on the worksheet (LOGIN, MAIL, SYSTEM, and PUBLIC) are created as a part of installation.

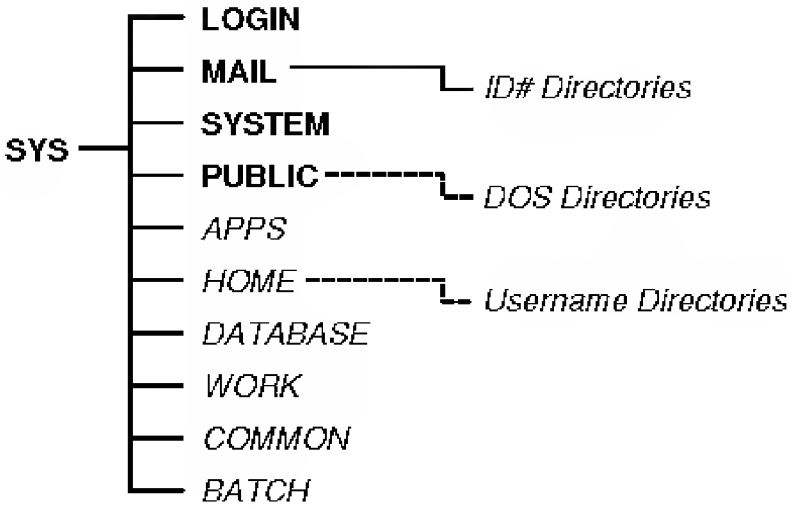
As network supervisor, you create additional directories.

Some directories, such as DOS directories, are essential. Others are optional, based on your needs. (See "Directory Structure" in *Concepts*.)

Planning directory structure is easier when you use a diagram similar to "Directory structure" on page 84.

In addition to the four system-created directories in the figure, the tree structure shows directories (in italics) that are created independently.

Figure 24 Directory structure



Plan for System-Created Directories

Plan for the following system-created directories (created during installation).

- *SYS:LOGIN*. Contains programs necessary for logging in.
- *SYS:MAIL*. Used by mail programs compatible with NetWare.

  Also contains a subdirectory for each user where user login scripts and print job configurations are stored.

  User subdirectories are created when you create user login scripts and print job configurations.
- *SYS:SYSTEM*. Contains operating system files as well as NetWare utilities and programs reserved for the network supervisor.
- *SYS:PUBLIC*. Contains NetWare utilities and programs for users.

Plan Additional Directories

Decide which of the following types of directories fit your needs.

- *DOS directories*. Store DOS program files.

  The number of DOS directories you create depends on the number of workstation brands and DOS versions on your network. (See "DOS Directories" in *Concepts*.)
- *Application directories*. Store application program files. See your application's documentation.

  Typically, you plan a directory for each application and other directories to keep data files.

  If you have two or more volumes, install your applications on a different volume than the data files. You can simplify your daily backups by backing up only on the data volume.

  You can install an application that must be installed at the root directory level in a subdirectory by mapping a search drive to a *fake root*. (See "MAP" in *Utilities Reference*.)
- *Username directories*. Provide personal work space for users.

  Plan a parent directory for username subdirectories and private username directories for all users. You may want to limit directory size for these directories.

- *Work directories*. Provide group work space for users rather than using their username directory. Plan a separate directory for each major project.

  HINT: If you have two volumes, we suggest that you install your work directories on the second volume to simplify system backup.

- *Common or shareable directories*. Serve as a transfer point for copying files to and from other directories (without having to consider rights).

- *Batch file directories*. Store batch files. Use file trustee assignments and file attributes to adjust security.

  HINT: When you have decided on the directory structure you want, record the directory names on the Directories Worksheet. (You may want to sketch a tree structure first to help you visualize the directories. "Directory structure example" on page 87.)

  HINT: You complete the rest of this worksheet when you plan security for your directories and files.

Directory Structure Example

File server UNICORN has one volume. The network has both IBM and COMPAQ workstations.

The IBM workstations run three versions of DOS, and the COMPAQs run one version of COMPAQ DOS. Four DOS directories are required.

The network has word processing, electronic mail, spreadsheet, and database applications. A parent directory, APPS, is planned, along with a subdirectory for each application's program files.

The electronic mail program creates its own directory structure.

The HOME directory provides personal work space for users in username subdirectories (but disk space is limited since the workstations have hard disks).

The ACCTNG directory contains data files for all applications used by the accountants.

The PAYROLL directory contains data record files for the payroll database.

The network supervisor first diagrammed the directory structure (see "Directory structure example" on page 87) and then recorded the directories on the Directories Worksheet ("Directories Worksheet" on page 88).

Figure 25 Directory structure example

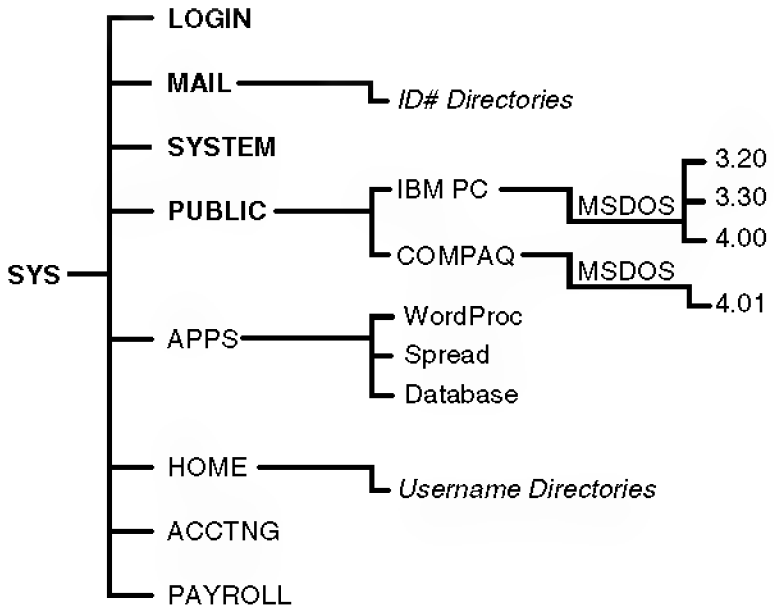
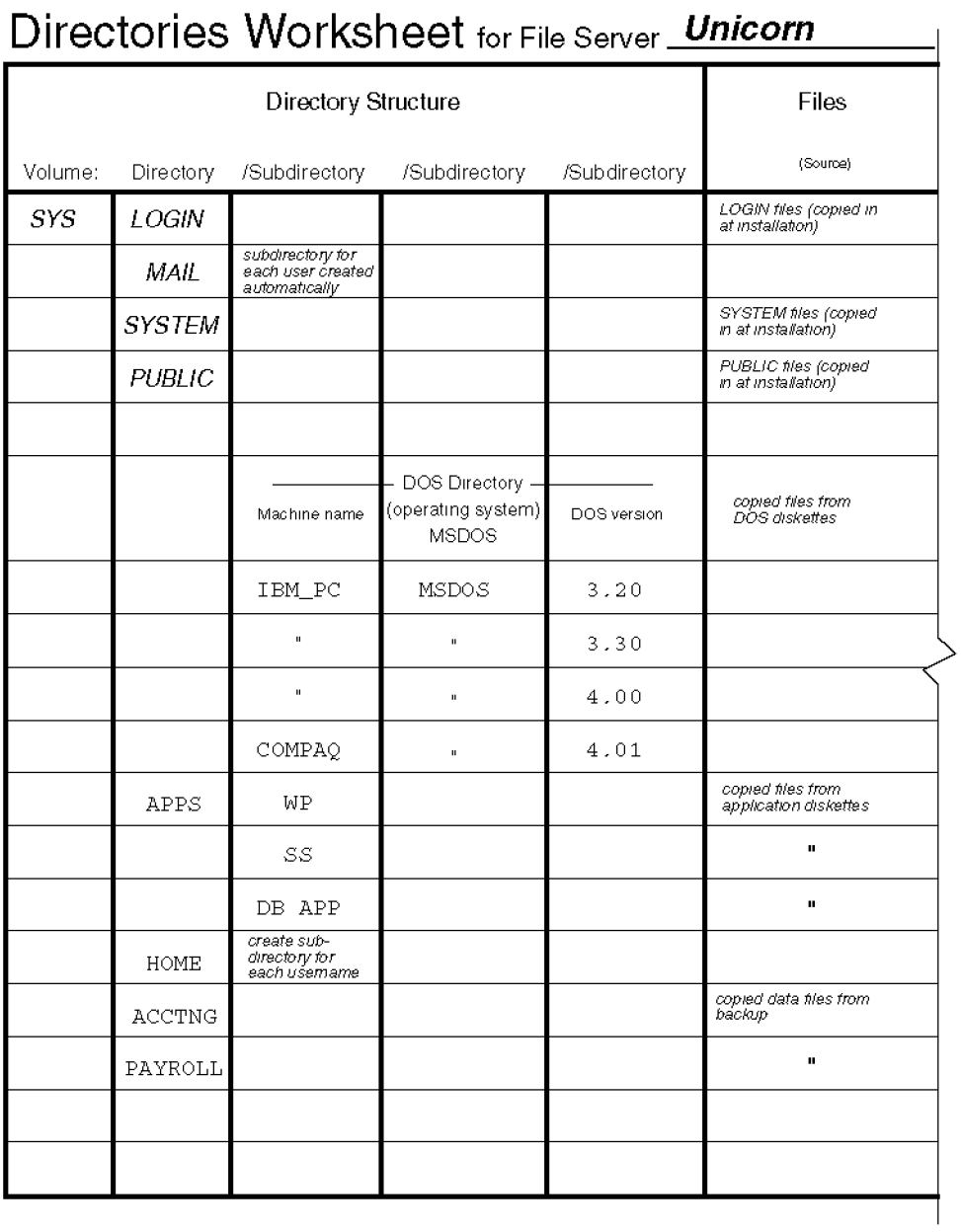


Figure 26 Directories Worksheet



Directories Worksheet for File Server *Unicorn*

Directory Structure					Files
Volume:	Directory	/Subdirectory	/Subdirectory	/Subdirectory	(Source)
SYS	*LOGIN*				*LOGIN files (copied in at installation)*
	MAIL	*subdirectory for each user created automatically*			
	SYSTEM				*SYSTEM files (copied in at installation)*
	PUBLIC				*PUBLIC files (copied in at installation)*
		Machine name	DOS Directory (operating system) MSDOS	DOS version	*copied files from DOS diskettes*
		IBM_PC	MSDOS	3.20	
		"	"	3.30	
		"	"	4.00	
		COMPAQ	"	4.01	
	APPS	WP			*copied files from application diskettes*
		SS			"
		DB APP			"
	HOME	*create sub-directory for each username*			
	ACCTNG				*copied data files from backup*
	PAYROLL				"

Plan Users and Groups

Use the Users Worksheet and copies of the Group Worksheet found at the end of the manual as you complete this section.

The network supervisor allows people to work on the network by defining them on the file server as users. A user has a username and a user account.

To simplify network administration, the network supervisor can define groups of users who use the same applications, perform similar tasks, or who have similar needs for information or printing.

When the file server is first brought up, the bindery already contains users SUPERVISOR and GUEST and group EVERYONE.

As network supervisor, you define all other users and groups, unless you delegate those responsibilities to a Workgroup Manager.

To delegate that responsibility, you can organize workgroups, or you can delegate account management to a User Account Manager without creating a workgroup.

For more information, see "User," "Group," "Workgroup Manager," and "User Account Manager" in *Concepts*.

Plan Usernames

Make a list of everyone who will work on the network. Decide the username format you will use, such as

- Given names (for example, GEORGE or JANENE).
- Initials and surnames (for example, GELIOT or JGRADY).
- Surnames (for example, ELIOT or GRADY).

  HINT: If you assign initials and surnames, you are less likely to have problems with duplicate names.

Usernames can use any valid DOS characters and can be up to 47 characters. However, keep in mind that username directories are still limited to the 8 characters that DOS displays.

Plan Workgroups (Optional)

Form workgroups (perhaps by organizational divisions) and delegate the tasks of managing accounts or creating users and groups.

Each workgroup can be assigned a separate volume or directory. Workgroups can be managed by

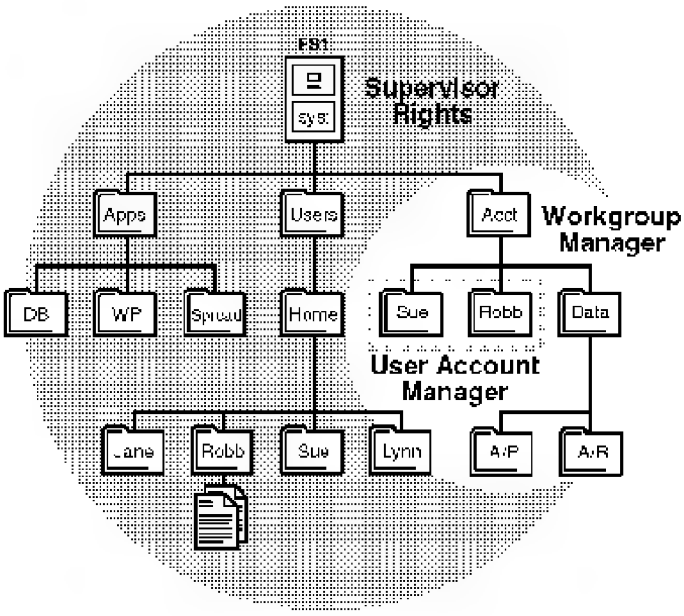
- A Workgroup Manager, who can create new users and manage user accounts within a workgroup.
- A User Account Manager, who can manage only assigned users' accounts.

As "Comparing SUPERVISOR and Manager rights" on page 91 illustrates, SUPERVISOR has all rights to the file server.

A Workgroup Manager shares those rights but is restricted to a specific area on the file server (a volume or directory, for example).

A User Account Manager has supervisory rights over only those user accounts assigned by the network supervisor.

Figure 27 Comparing SUPERVISOR and Manager rights



Comparing SUPERVISOR and Manager Rights

The system is flexible, and you can delegate as much responsibility as seems appropriate.

For example, you do not need to create a workgroup to delegate account management. Just assign one or more users to a User Account Manager to manage.

Only existing users and groups can be designated managers.

For managers to make trustee assignments, assign them the Supervisory right [S] in a volume or a directory reserved for the workgroup, or in other directories the users need access to.

NOTE: For users created by Workgroup Managers to belong to group EVERYONE, Workgroup Managers must also manage group EVERYONE.

If you designate a Workgroup Manager for a workgroup, you must create a user (or a group), designate that user (or group) as Workgroup Manager, and then assign the Workgroup Manager the Supervisory right [S] or all rights to a volume or a directory reserved for the workgroup.

The Workgroup Manager can then create users and groups for the workgroup. The Workgroup Manager can also manage user accounts and create new workgroup members when needed.

Or, to set up the network without assistance, create the users and groups and assign a designated Workgroup Manager to manage those users and groups.

The effect is the same as if users and groups had been created by Workgroup Managers, since Workgroup Managers can manage their accounts.

Workgroup Managers can create additional users and groups as needed.

If you prefer not to delegate the right to create users, create all users and groups and then assign them to User Account Managers (with or without workgroups).

To allow the User Account Manager to make trustee assignments, assign the Supervisory right [S] in the volume or directory reserved for the workgroup.

For more information, see "Workgroup Manager" and "User Account Manager" in *Concepts*.

Plan Groups (Optional)

Regular network groups are organized within the pool of users (or within workgroups) to simplify system administration.

Groups are created as empty sets, and then members are added. A user can belong to up to 32 groups.

Decide which groups to create by considering the following criteria:

- *Applications used*. You can plan a group for each application; for example, WPUSERS for a word processing application.
- *Job responsibilities*. You can plan groups for shared job responsibilities; for example, PAYCLERK for payroll data entry clerks.
- *Information needs*. You can plan groups for shared information and access needs; for example, PAYREAD for users who need to view payroll records but shouldn't modify them.
- *Printing needs*. You can plan a group based on the print server, printer, or print queue used; for example, PRIORITY for users assigned to a priority print queue.

For more information, see "Group," "User," and "Workgroup Manager" in *Concepts*.

HINT: When you have decided who will use the network, the username form you will use, and the groups you need to create, record your planning decisions on the Users Worksheet and the appropriate copies of the Group Worksheet.

HINT: If you have workgroups, use a separate copy of the Users Worksheet for each workgroup.

Select a User Definition Utility

Three utilities allow you to define users:

- *SYSCON. Use to create users and groups, specify workgroup and user account managers, and to designate trustee assignments.*
- *MAKEUSER*. Use to create large groups of users. MAKEUSER is particularly useful if you must regularly create and delete large groups of users.
- *USERDEF*. Use to create a template and then create large groups of users from the template. USERDEF works in conjunction with MAKEUSER.

You can create users one at a time in SYSCON after system defaults are set.

You can create multiple users by creating and executing a MAKEUSER file (similar to a batch file) or by creating a USERDEF template that defines the parameters for multiple usernames you enter for processing.

For the advantages and disadvantages of each utility, see "Utilities for Creating Users" under "User Account" in *Concepts*.

The setup procedure in this manual is based on creating users with SYSCON. (See "Set Up Users with SYSCON" on page 125.)

The User Defaults Worksheet is designed to be used with SYSCON, but can also be used with MAKEUSER and USERDEF.

To use " MAKEUSER" or " USERDEF," see *Utilities Reference* to help you plan a MAKEUSER file or a USERDEF template.

Users and Groups Example

The network supervisor for file server UNICORN started with a list of users and their job titles, including the following:

Susan R. Leiter, vice president

Mary Lynn Graviet, payroll manager
George Eliot, supervisor, payroll clerks
Darius P. Miner, payroll clerk
Judith L. Burns, payroll clerk

Howard C. Rask, accounting supervisor
Janene M. Grady, accountant
J. S. Bach, accountant
Gamal H. Beltagi, accountant
Marvin O. Ellsworth, accountant

The network supervisor plans to use a combination of initials and surnames for usernames, such as

SRLEITER
MLGRAVIET
GELIOT
DPMINER
JLBURNS
HCRASK
JMGRADY
JSBACH
GHBELTAGI
MOELLSWORTH

The following groups will be created, based on applications used, job responsibilities, and information needs.

SPREADSHEET	For accountants using a spreadsheet application
WPUSERS	For the vice president, manager, supervisors, and accountants
PAYROLL	For the manager and payroll supervisor
PAYREAD	For the vice president and GUEST (who will be assigned a password)
PAYCLERK	For payroll clerks who enter data

The network supervisor plans to assign the payroll manager as the User Account Manager for all payroll clerks after they are created as users.

The entry on the Users Worksheet for Darius P. Miner records the following decisions (directories required for application-based groups are not listed).

Username:	DPMINER
Application Used:	Database
Groups:	PAYCLERK
Access to Directories:	SYS:HOME\DPMINER SYS:PAYROLL
Time Restrictions:	M-F 7am-6pm SAT 7am-1pm
Station Restrictions:	[00001B02757A] [32]
Managed by:	MLGRAVIET
Operator or Manager:	n/a

The Group Worksheet for WPUSERS records the following decisions.

Group Name:	WPUSERS
Basis of Group:	word processing
Full Name:	word processing users
Managed by:	MLGRAVIET
Access to Directories:	SYS:APPS\WP SYS:APPS\WP\SETUP
Trustee Directory Assignments:	SYS:APPS\WP [RF] SYS:APPS\WP\SETUP [RWCEMF]
Access to Files:	n/a
Trustee File Assignments:	n/a
Usernames of Members:	SRLEITER MLGRAVIET GELIOT HCRASK JMGRADY JSBACH GHBELTAGI MOELLSWORTH

Decide Whether to Install Accounting

Use the User Defaults Worksheet as you complete this section. Record your decisions about the Accounting feature.

You can select Accounting as an option in SYSCON. We suggest that for your initial setup you make only the following decisions:

- Whether to install Accounting.
- The initial account balance for users (if you install Accounting).

By installing Accounting, you can automatically use Auditing utilities to tracks how often users log in and out. You can track users without assigning account balances.

You can also use Accounting to compute charges for file server services.

To determine a charge rate, monitor your file server for two or three weeks. Then set a charge rate based on your costs and the amount you must recover over a fixed period.

For suggestions on account balances for users, see "Account Balance" on "Plan Defaults for Users" on page 97.

For more information, see "Accounting" under "SYSCON" in *Utilities Reference*; see also "Accounting" in *Concepts*.

HINT: On the User Defaults Worksheet, record whether you want to install Accounting. If you do, you can also assign an initial account balance for system defaults.

Accounting Example

The network supervisor for file server UNICORN plans to install Accounting to monitor how often users log in and out. No account balance or limits will be assigned.

However, after monitoring the file server, the supervisor will also use Accounting to apportion network costs between the accounting and payroll departments.

Plan Defaults for Users

Use the Users Worksheet, the User Defaults Worksheet, and copies of the Group Worksheet as you complete this section.

You can set system defaults in "Supervisor Options" of SYSCON before you create users and user accounts.

You can set

- Default Account Balance/Restrictions.
- Default Time Restrictions.
- Intruder Detection/Lockout.

Users created after the defaults are set have the same user characteristics.

You can change account balances and restrictions by resetting defaults when you create additional users, or you can modify individual user accounts after users are created.

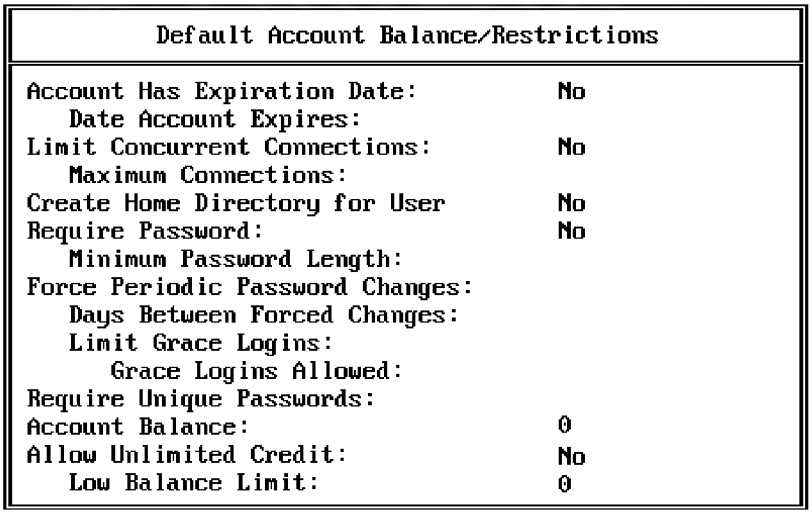
Even if you define users by creating a MAKEUSER file or a USERDEF template, you can still incorporate the planning decisions you make in SYSCON.

Some features, such as station restrictions, must be assigned individually after users are created.

Determine Default Account Balance/Restrictions

"Default Account Balance/Restrictions" in SYSCON displays the following initial settings:

Figure 28 Default Account Balance/Restrictionsscreen



The defaults set no restrictions. For greater security, change the default settings. Each field is explained below.

- *Account Has Expiration Date*. To set up temporary accounts, set this to "Yes."

  Date Account Expires is set by accepting the default (the first day of the next month) or by entering a new date. The account is disabled on the expiration date at 12:01 a.m.

- *Limit Concurrent Connections*. To make users log out of one workstation before logging in to another, set this to "Yes."

  To limit the number of workstations a user can be logged in to, set the Maximum Connections by typing the number of workstations.

- *Create Home Directory for User*. To have NetWare create a home directory for users as you create them, set this to "Yes."

- *Require Password.* We recommend that you require passwords, and that you accept the following defaults which appear when you set this to "Yes":

Password elements	Default
Minimum Password Length	5 characters
Force Periodic Password Changes	Yes
Days Between Forced Changes	40
Limit Grace Logins (the number of times a user can log in with an expired password)	Yes
Grace Logins Allowed	6
Require Unique Passwords (prevents users from recycling favorite passwords)	Yes

If you do not want to accept the default on a parameter, enter a new value.

- Account Balance. (Appears only if you install Accounting.) Leave the balance at the default if you do not plan to monitor or charge for file server resources.

  If no charge rates are set, the account balance is irrelevant. However, when a charge rate is set, the account balance is reduced when the network resource is used.

  To charge for network resources, assign an initial account balance. We suggest you start with 1,000 units of credit.

  Determine how much you will charge per month based on connect time, blocks read, or blocks written.

  When the user works on the network, the balance is reduced according to the charge rate you set for the resource.

  You can set credit limits before you establish charge rates. The limits do not restrict user accounts until the charge rates are in effect.

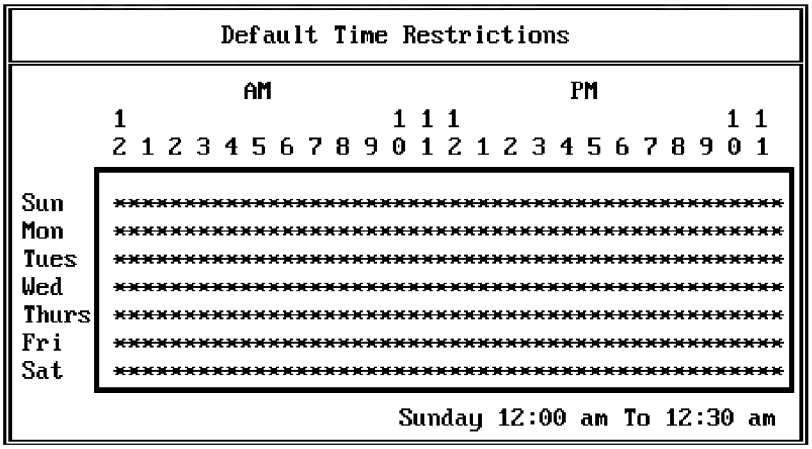
- *Allow Unlimited.* Credit. The default setting for Allow Unlimited Credit is "No." If charge rates are established, users cannot continue to charge once the balance is depleted. To allow unlimited credit, change the setting to "Yes."

If you plan to charge for file server services, you can limit how low the account balance can go by entering a new number (even a negative number) for the "Low Balance Limit."

Determine Default Time Restrictions

For increased security, specify the hours that users can log in. Time restrictions are set by days of the week in half-hour blocks.

Figure 29 Default Time Restrictions screen



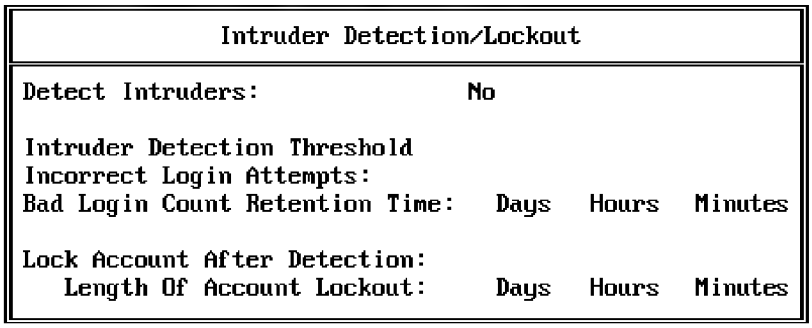
- For all users to have the same restrictions, assign "Default Time Restrictions" in SYSCON.
- For individual user restrictions, set time restrictions when you set up each user's account.

Determine Intruder Detection/Lockout Capabilities

For maximum security, activate "Intruder Detection/Lockout."

After an intruder makes several unsuccessful attempts to log in using an incorrect password, the file server locks the intruder out.

Figure 30 Intruder Detection/ Lockout screen



- *Detect Intruders.* To activate "Intruder Detection/Lockout," set this field to "Yes."
- *Intruder Detection Threshold.* Set the threshold by specifying the number of "Incorrect Login Attempts" the file server accepts before disabling the account. (Default: 7.)

  "Bad Login Count Retention Time" is the amount of time the file server monitors incorrect login attempts after the last incorrect login attempt was detected. (Default: 30 minutes.)
- *Lock Accounts after Detection.* When "Intruder Detection/Lockout" is activated and the threshold for incorrect login attempts is exceeded, the account is locked.

  The default for "Length of Account Lockout" is 15 minutes, but you can specify a longer period.

  SUPERVISOR can unlock disabled accounts. However, the network supervisor needs a back door into the system in case an intruder locks the SUPERVISOR account.

  See "SUPERVISOR" in *Concepts*.

  HINT: After you decide the settings you want to make for "Default Account Balance/Restrictions," "Default Time Restrictions," and "Intruder Detection/ Lockout," record your settings on the User Defaults Worksheet.

  HINT: To create users in separate groups or workgroups with different default settings, use a separate copy of the worksheet for each group or workgroup.

Plan Individual Account Features

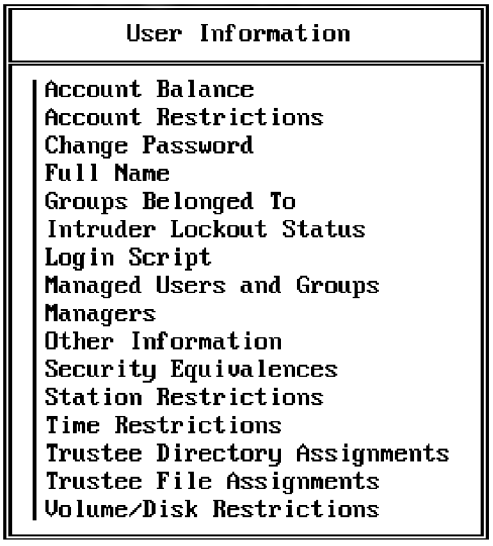
Use the Users Worksheet and your Group Worksheets as you complete this section.

You must set options and restrictions that have no system default.

Account restrictions that can be assigned with system defaults can also be assigned individually. You may prefer to add or remove restrictions set with system defaults.

When you select a user from the list of existing users, the following menu appears. Each option is explained below.

Figure 31 User Information screen

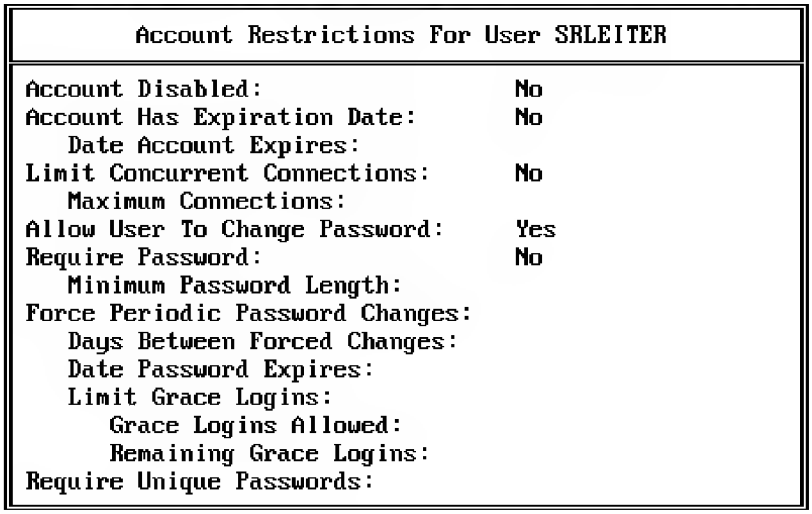


- *Account Balance*. Appears if you have installed Accounting. If you did not assign a default initial account balance, you can assign account balances and credit limits to users individually.
- *Account Restrictions*. Allows you to set account restrictions if you do not set them as defaults.

  Or you can define users with system defaults; then after the users have been created, you can modify particular user accounts by adding or removing restrictions.

The following form appears when you select "Account Restrictions."

Figure 32 Account Restrictions screen



To set individual user restrictions, modify the default settings shown above. (Disable an account by changing "Account Disabled" to "Yes.")

- *Change Password.* Allows you to assign a password to a user.

  If you are upgrading or creating multiple users, you can assign the same password to all users in a workgroup and they will be prompted to change their passwords the first time they log in. (Your system is secure only until users know the initial password or the password pattern.)

  If you assign passwords and require periodic changes to the password, the users are prompted to change their password the first time they log in, once the limits set in the "Account Restrictions" screen have expired.

- *Full Name.* Allows you to record a user's full name as it appears on the Users Worksheet.

- *Groups Belonged To.* Allows you to assign a user to groups. However, initial network setup is easier if you access the groupname and then assign users as members. (See "Set Up Users with SYSCON" on page 125.)

- *Intruder Lockout Status.* (No input is necessary.) Appears only if you activate "Intruder Detection/Lockout" (see "Determine Intruder Detection/Lockout Capabilities" on page 100). No input is necessary.

Allows you to view a record of unauthorized attempts to log in to a user account.

- *Login Script*. After you create users, this allows you to access a user's login script. You can create a login script or copy and modify an existing login script.
- *Managed Users and Groups*. Allows you to assign users and their accounts to a User Account Manager. Indicate this in the "Operator or Manager" column of the Users Worksheet.
- *Managers*. Allows you to designate a User Account Manager. Record the User Account Manager's username in the "Managed by" column of the Users Worksheet.
- *Other Information*. (No input is necessary). Allows you to view the user's ID number, the date and time of the user's last login, and whether the user is designated as a console operator.
- *Security Equivalences*. (Optional) Allows you to assign security equivalences to a user. Use caution: A security equivalence gives a user access to the directories and files of another user, so this option is best used to assign rights temporarily.
- *Station Restrictions*. Allows you to restrict the physical locations that a user can log in from.

  To restrict a user to a particular workstation, you need the network and node (station) addresses for each workstation.

  For a list of these addresses, see the Workstation Configuration Worksheet. Record the addresses in the "Station Restrictions" column of the Users Worksheet.
- *Time Restrictions*. Allows you to set time restrictions for a user in the same way that "Default Time Restrictions" are set (see "Determine Default Time Restrictions" on page 100).

  If you restrict time for some users, record the allowable times in the "Time Restrictions column" of the Users Worksheet.
- *Trustee Directory Assignments*. Allows you to assign a user as a trustee of a directory.

  If you specify a directory that does not exist, SYSCON creates the directory. (When possible, make trustee assignments to groups rather than to individual users.)

- *Trustee File Assignments*. Allows you to control a user's access to files. (When possible, make trustee assignments in directories rather than to files.)
- *Volume Disk Restrictions*. Allows you to limit a user's disk space (in kilobytes) in a volume.

Figure 33 User Disk Volume Restrictions screen

```
        User Disk Volume Restrictions

Limit Volume Space?              No
Volume Space Limit:              0 Kbytes
Volume Space In Use:             0 KBytes
```

HINT: When you have decided the settings you want for individual users, record your planning decisions in the appropriate spaces on the Users Worksheet.

User Definition Defaults Example

The network supervisor for file server UNICORN recorded the following decisions on the User Defaults Worksheet and the Users Worksheet:

- User accounts have no expiration date.
- The initial account balance is set to 1,000 units. Unlimited credit is allowed while network use is monitored.
- Concurrent connections are limited to two workstations.
- "Intruder Detection/Lockout" is activated. The threshold default is accepted; bad login count retention time is set to one hour; and after intruders are detected, user accounts are locked for 12 hours.
- Passwords are required. Password defaults are accepted.
- Time restrictions are set individually for payroll clerks and are limited to the hours between 7 a.m. and 6 p.m., Monday through Friday.
- Station restrictions are set to limit management users to two workstations. Other users are limited to their own workstations.

Plan Network Security

Use the Directories Worksheet, the Trustee Directory Security Worksheet, and the Trustee File Security Worksheet as you complete this section.

Although NetWare security is flexible and can be used in complex ways, we recommend a simple security setup with appropriate security for different kinds of directories and files.

You can implement more complex solutions as your network evolves.

For a sample security setup, see "Security Example" on page 112.

Security for directories and files is controlled by rights and attributes:

- *Rights security.* Applies to users and controls which directories, subdirectories, and files a user can access and what work the user is allowed to do with those directories, subdirectories, and files.
- *Attribute security.* Applies to directories, subdirectories, and files and determines whether they can be viewed, modified, shared, renamed, or deleted. Attributes take precedence over rights.

Plan Rights Security for Users and Groups

Rights security is controlled by Inherited Rights Masks and trustee assignments.

- *Inherited Rights Masks.* An Inherited Rights Mask is automatically assigned to each directory or file when it is created.

  For a basic security setup, you do not need to modify the Inherited Rights Mask. For information on the effects of modifying the mask, see "Security" in *Concepts*.

- *Trustee Assignments*. When users or groups are granted rights to specific directories or files, the users or groups become trustees of those directories or files.

  The sum of the rights becomes the *trustee assignment*.

  A trustee assignment allows a user or group to use the directory or file in a particular way; for example, only for reading.

  The network supervisor selects the rights to assign to users or groups in each directory or file.

- *Trustee Rights*. The same trustee rights control access to directories and files in both trustee assignments and Inherited Rights Masks.

  Each right is represented by an initial letter, and the letters are enclosed in brackets: [SRWCEMFA].

  Trustee rights are outlined below:

Table 9 Trustee Rights

Letter	Right
S	Supervisory
R	Read
W	Write
C	Create
E	Erase
M	Modify
F	File scan
A	Access control

As you determine your security needs, consider the following:

- *System-created directories and files*. The system automatically makes the trustee assignments and assigns the following to group EVERYONE:

  PUBLIC [RF]
  MAIL [C]

- *DOS directories*. For DOS directories in SYS:PUBLIC, the system automatically assigns Read and File Scan rights [RF] to group EVERYONE.

- *Application directories*. If you create application directories in SYS:PUBLIC, EVERYONE already has Read and File Scan rights [RF] in that directory.

  If you create a parent directory for applications, assign the File Scan right [F] to group EVERYONE.

To the application directories themselves, whether in the parent directory or in volume SYS:, assign Read and File Scan rights [RF] to group EVERYONE or to the groups you formed for application use.

NOTE: If you have an application that creates extra files (such as backup files), assign each user the Create right [C] in the directory where the application creates those files.

- *Home or username directories*. Each user needs all rights to personal work space. Assign each user (except GUEST) the Supervisory right [S] in their username directory.

  To provide personal work space for temporary users in a GUEST directory, assign GUEST the Read, Write, Create, Erase, and Modify rights [RWCEM].

  Since the GUEST directory provides personal work space, assign the Modify right [M]. (Use caution in assigning GUEST the Access Control [A], Supervisory [S], or Modify [M] rights.)

- *Database directories for data files*. If you plan groups based on job responsibilities, make trustee assignments of at least the Read, Write, Create, Erase, and Modify rights [RWCEM] to groups that need to modify data files in database applications.

  Some database programs require all rights except Supervisory [S]. For groups that need to view information, assign the Read right [R].

- *Work directories*. Assign the Read, Write, Create, Erase, and Modify rights [RWCEM] to groups that need to modify data files. For groups that need to view information, assign the Read right [R].

- *Batch file directories*. Assign Read and File Scan rights [RF] to group EVERYONE.

  Examine each directory you listed on the Directories Worksheet. Then follow the decision process below for each directory.

Planning Rights Security for Users and Groups

Procedure

1. Decide which groups or users need access to the directory.
2. Decide whether the groups or users need to view the files in the directory for information.
3. Decide whether the groups or users need to modify the files in the directory.

4 Decide what else the groups or users need to do.

5 If you have files you want to make a separate trustee assignment for, repeat the decision process for those files.

HINT: After you determine rights and trustee assignments, record trustee assignments on the Trustee Directory Security Worksheet.

HINT: If you assign trustee rights for particular files, record those assignments on the Trustee File Security Worksheet.

For more information, see "Rights Security" and "Effective Rights" under "Security" in *Concepts*.

Plan Attribute Security for Directories and Files.

Attribute security assigns properties to individual directories or files. Some attributes can be assigned to both directories and files, and others only to files.

Each attribute is represented by its initial letters, enclosed in brackets.

Table 10 Attribute security properties

Attributes	Letter	Directory/File	Description
Archive needed	A	F	Identifies files modified after last backup. Assigned automatically.
Copy Inhibit	C	F	Prevents Macintosh users from copying a file. Overrides Read and File Scan rights. Modify right required to remove this attribute.
Delete Inhibit	D		Prevents users from erasing directories or files. Overrides Erase right. Modify right required to remove this attribute.
Execute Only	X	F	Prevents copying or backing up files. *Attribute cannot be removed.* Assign only to files with an .EXE or .COM extension (program files). Keep a duplicate of these files in case they become corrupted and need to be replaced. *CAUTION*: Some programs do not execute properly if flagged Execute Only.

Attributes	Letter	Directory/File	Description
Hidden	H		Hides directories and files from DOS DIR scans and prevents them from being deleted or copied. Directories and files appear in NetWare NDIR scan if user has the File Scan right.
Indexed	I	F	Allows large files to be accessed quickly. Automatically assigned to files with over 64 regular FAT entries. Can be set, but has no effect.
Purge	P		Purges a file as soon as it is deleted if the file is flagged with this attribute or if the file resides in a directory flagged with this attribute. *CAUTION*: Purged files cannot be recovered with SALVAGE.
Read Audit	Ra	F	Not currently used. Can be set, but has no effect.
Read Only/Read Write	Ro/ Rw	F	Indicates whether a file can be modified. All files are automatically flagged Read Write when they are created and can be modified unless the Read Only attribute is set. Assigning Ro automatically activates Delete Inhibit and Rename Inhibit. Modify right required to remove the Ro attribute.
Rename Inhibit	R		Prevents users from renaming directories or files. Modify right required to remove this attribute.
Shareable	S	F	Allows several users to access a file simultaneously. Usually used in combination with the Read Only attribute.
System	Sy		Assign to system files and their directories. Hides these directories and files from DOS DIR scans and prevents them from being deleted or copied. Directories and files appear in NetWare NDIR scans if a user has the File Scan right.
Transactional	T	F	Activates the Transaction Tracking System (TTS). Prevents data corruption by ensuring that all changes are made to files being modified or that none are. Especially helpful for database files.

Attributes	Letter	Directory/File	Description
Write Audit	Wa	F	Not currently used. Can be set, but has no effect.

Consider the following conditions and recommendations for your directory trustee assignments.

- System-created directories and files. These files are flagged Read Only [Ro], Delete Inhibit [D], and Rename Inhibit [R] by the system. No additional attributes are necessary.
- *DOS directories*. Flag DOS files Read Only/Shareable [RoS]. The system adds the Delete Inhibit [D] and Rename Inhibit [R] flags.

  NOTE: Do not confuse [RoS] with [ROS] rights in earlier versions of NetWare.
- *Application directories*. Flag application program files Read Only/ Shareable [RoS].

  To prevent anyone from copying software illegally, flag the principal executable file of each application Shareable/Execute Only [SX].

  WARNING: Not even SUPERVISOR can copy files flagged Execute Only [X]. Files flagged with this attribute can only be deleted. Do *not* use this file attribute unless you have a backup copy of your application program files.

  Be sure that neither your license nor the installation program for your application restricts the number of times you can copy the files to the network.
- *Database directories for data files*. Files to be modified should be flagged Read Write/Shareable [RwS]. (Modify rights are required for files flagged Shareable [S] or Delete Inhibit [D].)

  If your database contains highly sensitive information that you do not want remaining on the hard disk after it has been deleted, flag the directory Purge [P] so that files in that directory are purged upon deletion.

  Purged files cannot be recovered.
- *Work directories*. Files to be read but not modified should be flagged Read Only/Shareable [RoS].
- Batch file directories. Flag the files Read Only/Shareable [RoS]. After you determine file attributes, record those settings on the Directories Worksheet.

For more information, see "Attribute Security" under "Security" in *Concepts*.

Security Example

The network supervisor for file server UNICORN planned the following directory trustee assignments:

User/Group	Directory	Rights
EVERYONE	SYS:APPS SYS:HOME\GUEST	[F] [RWCSMF]
Each user	SYS:HOME*username*	[S]
GUEST	SYS:HOME\GUEST	[RWCEMF]
SPREADSHEET	SYS:APPS\SPREAD SYS:ACCTNG	[RF] [RWCEMF]
WPUSERS	SYS:APPS\WP SYS:APP\WP\SETUP	[RF] [RF]
PAYROLL	SYS:APPS\DB_APP SYS:PAYROLL	[RF] [RWCEMF]
PAYREAD	SYS:APPS\DB_APP SYS:PAYROLL	[RF] [RF]
PAYCLERK	SYS:APPS\DB_APP	[RF] RWCEMF]
MJONES	SYS:APPS\DB_APP SYS:PAYROLL	[S] [S]

All files are flagged as recommended above.

Create the Directory Structure

Once the directory structure has been planned, create the directory structure by using either the DOS CD (Change Directory) and MD (Make Directory) commands, or by using the NetWare FILER utility.

A brief overview of each option follows.

- *DOS*. For supervisors with DOS experience, the MD and CD commands are direct and efficient.
- *FILER*. FILER is menu-driven so you can select from lists or insert new directory names to create directory structure level by level. See "FILER" in *Utilities Reference*.

You can use either SYSCON or USERDEF to create user home directories while creating users. A brief overview of each utility follows.

- *SYSCON*. When you create users and set up user accounts with SYSCON, you can create username directories too.

  If you specify a directory that does not exist, SYSCON creates the directory. (See "Set Up Users with SYSCON" on page 125.)

- *USERDEF*. If you create users with USERDEF, USERDEF creates your DOS directories and username directories. (See "USERDEF" in *Utilities Reference*.)

Install Applications on the Network

You can install DOS, Windows, and various types of network applications, such as word processing or spreadsheet programs, and make them available to users.

Install DOS and Windows before installing DOS and Windows applications.

Install DOS

You can create all DOS directories and load all DOS files from one workstation on the network.

If you completed the planning worksheets, you recorded the required DOS directories on the Directories Worksheet. See also "DOS Directories" in *Concepts*.

NOTE: As you create DOS directories and copy DOS files onto the network, make sure you comply with all copyright laws. Each workstation must boot with its own licensed copy of DOS or other client operating system.

You must have a workstation logged in to the network, running DOS 3.30 or later.

Procedure

1. Boot a workstation.

   Turn on the workstation. (The file server should be up and running with volume SYS: mounted.)

   If you have not prepared boot files, create a DOS boot diskette.

2. Log in as SUPERVISOR by typing

   LOGIN *fileserver*\SUPERVISOR <Enter>

   Replace *fileserver* with your file server's name.

Information from the default login script, similar to the following, appears:

Figure 34 Default login script example

```
Good morning, SUPERVISOR.

Drive  A:   maps to a local disk.
Drive  B:   maps to a local disk.
Drive  C:   maps to a local disk.
Drive  D:   maps to a local disk.
Drive  E:   maps to a local disk.
Drive  F: = ALICE\SYS:  \SYSTEM
      -----
SEARCH1:  = X:. [ALICE\SYS:  \PUBLIC]
SEARCH2:  = W:. [ALICE\SYS:  \]

F:\SYSTEM>
```

When you first log in as SUPERVISOR, no password is required. For increased security, assign SUPERVISOR a password in SYSCON when you create users and set up user accounts.

For more information on SUPERVISOR account security, see "SUPERVISOR" in *Concepts*.

3 Set the prompt.

You are in the SYS:LOGIN directory. If your prompt does not display the directory path, type

PROMPT PG <Enter>

4 Change to the SYS:PUBLIC directory.

5 Create a directory in SYS:PUBLIC for each workstation type and each version of DOS users will need.

Name your directories according to the following convention:

SYS:PUBLIC*machineos_type**os_version***

For each directory, replace *machine* with the six-letter machine name of the workstation (such as IBM_PC or COMPAQ).

Replace *os_type* with the type of DOS you are using (such as MSDOS or DRDOS). Replace *os_version* with the DOS version number.

These variables correspond to login script variables that you can use for mapping drives in login scripts (Step 9).

For example, to install MSDOS 5.0 on an IBM PC, go to SYS:PUBLIC to create the DOS subdirectory. To use the DOS MD command, type the commands shown below (in order):

```
MD IBM_PC <Enter>CD IBM_PC <Enter>MD MSDOS
<Enter>CD MSDOS <Enter>MD 50 <Enter>CD 50 <Enter>
```

6 Load DOS.

Follow the instructions in the DOS documentation to load the DOS software into the directories you created.

7 Flag DOS files Read Only/Shareable

You must flag all DOS files to prevent users from corrupting the command files.

```
FLAG *.* RO S <Enter>
```

8 Repeat Step 6 and Step 7 for each DOS directory you create.

9 In the system login script, map the second search drive to the DOS directory.

NOTE: For an explanation of login scripts, see "Create Login Scripts" on page 145.

The first search drive should be mapped to the PUBLIC directory so that users can access NetWare utilities.

If all users have the same types of computers and are using the same version of DOS, you probably only need one DOS directory.

In this case, add a line similar to the following, substituting the correct directory names:

```
MAP S2:=SYS:PUBLIC\%MACHINE\%)S_VERSION
```

For the %MACHINE variable to work, make sure the long machine type is set in each station's NET.CFG file. For example, a station might have the following line in its NET.CFG file:

```
LONG MACHINE TYPE = IBM-PC
```

10 Add COMSPEC to the system login script.

Following is the proper syntax for the COMSPEC command:

```
COMSPEC=Y:COMMAND.COM
```

This command tells the workstation where to find the command processor.

For more information about	See
Loading DOS on the network	The DOS manual that came with your software.
Login scripts	"Create Login Scripts" on page 145.
Mapping search drives	"MAP" on page 170.
Running DOS on a workstation	Workstation for DOS and Windows.

Install Microsoft Windows (Optional)

You can install Windows onto a network in several ways:

- Install all Windows files on a user's local hard drive.
- Install Windows program files on the server, and user files on local hard drives.
- Install all Windows program and user files on the server.

  In most cases, this installation provides the easiest maintenance and most efficient use of resources.

Instructions for the first two options are included in the documentation that came with your Windows software.

Instructions for installing program and user files on the server are included in this section.

The following table points out some of the advantages and disadvantages of having Windows files installed on the server.

Advantages	Disadvantages
Program and configuration files are backed up and secure.	Causes more network traffic.
No hard disk is required on the user workstation.	
.INI and driver files for all users can be updated from one location.	
Configuration files always match hardware.	

Files Needed for NetWare to Function with Windows

The following files are needed for NetWare to function with Windows. These files are shipped with Windows.

File	Function
NETWARE.DRV	NetWare device driver. Contains executable code for NetWare-related functions.
NETWARE.HLP	Help file for NETWARE.DRV.
NETWARE.INI	Initialization file for NETWARE.DRV and other NetWare Windows utilities. Automatically created by NETWARE.DRV.
NWPOPUP.EXE	Handler for broadcast messages.
VNETWARE.386	Virtual NetWare device driver. Performs virtualization among sessions when Windows is in 386 Enhanced mode.
VIPX.386	Virtual IPX device driver. Virtualizes IPX communications among sessions when Windows is in 386 Enhanced mode.

These files allow you to connect network drives through the File Manager and to connect network printers through the Printers icon in the Control Panel.

To provide users with a single point of access to networking functionality, install the NetWare User Tools as explained in "Using Workstation Tools," Chapter 6 in Workstation Basics and Installation.

Guidelines for Running Windows from the Network

- Use a permanent swap file on a local hard drive if possible; do *not* use network directories for swap files. If a local swap file is not possible, consider increasing RAM to a minimum of 8 MB.
- RAM plus swap file size should be a minimum of 10 MB.
- Remove Windows search drives from the workstation AUTOEXEC.BAT file.
- If users are running DR DOS, make sure DR DOS files are dated 07 April 1992 or later.
- If users are running DR DOS, make sure their CONFIG.SYS files install EMM386.SYS and configure it for use with Windows.

  For configuration information, see your DR DOS manual or DR DOS online help.

Installing and Setting Up Microsoft Windows

Prerequisites

- A workstation logged in to the network, running DOS 3.30 or later.
- The Supervisor or Create right to the directory where you are loading Windows.
- A licensed network copy of Windows 3.1 or later.
- 16 MB of available disk space.
- A NetWare Workstation for DOS/Windows kit.

Procedure

1. Install Windows server software

   Use SETUP /A option. For information about Windows SETUP options and installation, see the documentation that came with your Windows software.
2. Create a group for users who will run Windows.

   For instructions on creating groups, go to Step 4.
3. Make the Windows Group a trustee of the Windows directory.

For instructions on granting trustee assignments, Step 6.

4 Create a directory for each user to store user-specific Windows files.

WIN.COM and files such as .GRP and .INI files are stored here.

5 Add the following information to the system login script.

NOTE: For an explanation of login scripts, see "Create Login Scripts" on page 145.

An example of the syntax used for these login script entries appears at the end of this step.

5a Map a drive to the user-specific directories for the Windows group.

5b Map a search drive to the Windows directory for the Windows group.

5c Set the Windows TEMP directory to a subdirectory of the user directory.

The following example shows the system login script entries you add to set up Windows on the network:

```
IF MEMBER OF "WIN31" THENMAP INS
P:=SYS:USERS\%LOGIN_NAME\WIN31MAP INS
S16:=SYS:APPS\WINAPPS\WIN31SET TEMP =
"P:\USERS\%LOGIN_NAME\WIN31\TEMP"END
```

6 Set up the workstations by completing the following:

6a Change to the search drive mapped to the Windows directory.

Enter the drive letter only.

6b Modify the user AUTOEXEC.BAT and CONFIG.SYS files by typing:

```
SETUP /N <Enter>
```

Select the "Custom" option to make sure environmental variables are correct. When Windows prompts for a path during setup, enter the drive letter instead of the path.

6c Install NetWare Tools.

NetWare Tools provide a single point of access for common network tasks such as mapping drives, connecting printers, and sending messages.

To install NetWare User Tools and update NetWare-specific files in the Windows directory, follow the procedures in "Preparing to Install

Workstation Software," Chapter 2 in *Workstation Basics and Installation*.

To	See
Create login scripts	"Create Login Scripts" on page 145.
Install Windows on the network	The Windows manual that came with your software.
Map search drives	"MAP" on page 170.
Run Windows on a workstation	NetWare Workstation for DOS and Windows.

Install Other Applications

When loading applications, keep the following in mind:

- You need the Create right in the directory where you install the application.
- Make sure the application is designed for network (multi-user) use, and that you observe licensing restrictions on the number of users who can access the application.
- To allow users to access network-based applications, map search drives to the directories that contain these applications.

  To make sure these search drives are permanent, place them in login scripts, which are executed when users log in.
- If the application requires that it be installed at the root of a volume, but you would rather install it in a subdirectory for security reasons, map the directory to a fake root. (See "MAP" on page 170.)

Procedure

1. Install application program files and set file attributes.

   To use third-party applications (such as word processing, spreadsheet, and database programs), install the program files into the directories you created for them.

   Refer to the documentation for each application.

   After files are installed into their directories, set file attribute security.

- *For applications with network versions*. If the third-party documentation includes instructions for loading the application on a network, follow those instructions. Then skip to Step 2.
- *For non-network applications*. If the documentation does not contain instructions for loading the application on a network, try the instructions for loading the application on a local hard disk.

  Some hard disk load commands don't work on network drives. If this is the case, consult the dealer who sold you the application.

Some applications have an install program that requires the program to be installed in a root directory (represented by the volume name in NetWare). NetWare allows you to map a *fake* root.

For more information, see "MAP" in *Utilities Reference*.

1a Map the drive letter that normally corresponds to a local hard disk to the directory you created for the application.

If you use local hard disk instructions, check to see whether the program requires the hard disk drive letter to be C: or D:.

For example, suppose you created a directory for an application in SYS:PUBLIC.

If the third-party documentation instructs you to copy the files to C:, type the following at the DOS prompt:

```
MAP ROOT C:=SYS:PUBLIC\directory <Enter>
```

The following message appears:

Figure 35 MAP message

```
Drive C: currently maps to a local disk.
Do you want to assign it as a network drive? (Y/N) Y
```

1b Press <Enter> to confirm.

1c Continue with the instructions in the third-party documentation for installing files on a hard disk, or insert each third-party diskette into drive A: and type

```
COPY A:*.* C: <Enter>
```

1d Flag the application program files Read Only/Shareable.

The default file attribute is Read Write. Use FLAG or FILER to change the file attributes of application files to Read Only/Shareable [RoS].

This prevents users from deleting or corrupting the program files (.EXE or .COM files).

When you flag a file Read Only, NetWare assigns the Delete Inhibit and Rename Inhibit attributes. (See "Attribute Security" under "Security" in *Concepts*.) Type

```
FLAG *.* RO S <Enter>
```

2 Copy necessary files onto the workstation boot diskettes.

Check the third-party documentation to see if the application modifies or creates a CONFIG.SYS or an AUTOEXEC.BAT file. If so, put those files on each user's boot diskette.

3 Copy data files into directories.

Load data files into the directories you created for them.

To copy data files, insert each diskette into drive A: and type

```
NCOPY A:*.* path
```

Replace *path* with the directory path to the application directory (or if you mapped the directory to a drive, the drive letter).

4 (Optional) Use FLAG or FILER to assign file attribute security.

For more information, see "FLAG" or "FILER" in *Utilities Reference*.

5 (Optional) Restrict disk space in directories.

Some DOS applications do not function well if they are in a large volume. Use DSPACE to limit the application directory's size.

You may also want to limit user space on the file server. With limited space, users may not be tempted to keep copies of applications in their own directories.

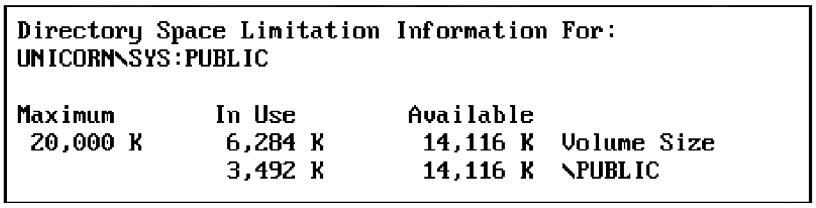
5a Determine the directory size by typing

```
CHKDIR path <Enter>
```

Replace *path* with the path of the directory you want to check. (You do not need to specify a path if the directory is your current directory.)

For example, if you specify SYS:PUBLIC, information similar to the following appears:

Figure 36 Directory Space Limitation screen



In this example, SYS:PUBLIC uses less than 3,500 kilobytes of disk space.

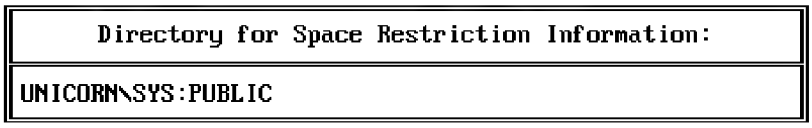
5b At the prompt, type

```
DSPACE <Enter>
```

5c Select "Directory Restrictions" from the "Available Topics" menu.

The current directory appears in the entry box for "Directory for Space Restriction Information."

Figure 37 Directory for Space Restriction screen

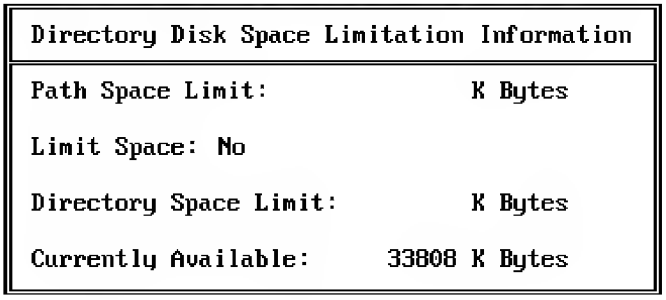


5d Enter the directory path for the directory you want to restrict.

- *If you know the directory path*. Type the directory path in the entry box, or use the <Backspace> key to delete the current directory path and type the directory path you want.
- *If you do not know the directory path*. Press <Ins> and select the directory path one level at a time beginning with the list of "Network Directories." When you have selected the directory path, press <Esc>.

5e Press <Enter> to access a "Directory Disk Space Limitation Information" form similar to the following.

Figure 38 Directory Disk Space Limitation screen



5f Change the "Limit Space" field to "Yes"; then press <Enter>.

The default limitation for disk space is 1,024 kilobytes.

- If this amount is satisfactory, press <Esc> and skip to Step 5h.
- To change the amount, use the Down-arrow key to move to the "Directory Space Limit" field.

5g Specify the maximum disk space in kilobytes by typing in a number; then press <Enter>.

- *For an application directory*. When you have loaded the application files, add a comfortable margin to the number in use for the directory.

  Use the sum as the upper limit (in kilobytes) for the directory to use.

- *For a username directory*. Determine the total amount of disk space (in kilobytes) you can allow users for personal work space.

  Divide this number by the total number of users; the result is the amount of disk space you can allow for each user.

  Limit each username directory to that amount. (Otherwise, the volume will run out of disk space before all users use up their allocations.)

5h Repeat Step 5a through Step 5g for every directory you want to restrict.

5i Press <Esc> to exit DSPACE.

To	See
Create login scripts	"Create Login Scripts" on page 145.
Map search drives and fake roots in login scripts	"MAP" on page 170.

Set Up Users with SYSCON

The procedures below outline the steps to setting up users and groups using SYSCON.

1 At the prompt, type

```
SYSCON <Enter>
```

2 (Optional) Install Accounting.

Accounting is optional. However, you must install Accounting to assign an account balance to users when you set system defaults.

You can also use Auditing utilities to monitor how often users log in and out. Later you can choose which additional Accounting functions are suitable for your network.

To help determine whether to install Accounting, see "Accounting" under "SYSCON" in *Utilities Reference*; see also "Accounting" in *Concepts*.

2a Select "Accounting."

The first time you select "Accounting" from the "Available Topics" menu, the "Install Accounting" box appears.

2b Select "Yes."

3 Set system defaults for users.

Use the User Defaults Worksheet as your guide in setting up system default restrictions in SYSCON.

If you did not complete the planning worksheets and need help determining the value to set for each parameter, "Plan Defaults for Users" on page 97; see also "Users" in *Concepts*.

System default restrictions are assigned to users as they are created. However, default restrictions are set up initially so that no password or time restrictions apply.

Unless you change the default restrictions, users will have no password, login, account restrictions, or time restrictions.

Changes to system defaults affect only user accounts created after the changes are made. Existing user accounts are not affected.

There are no default station restrictions. These must be established individually because users are restricted to specific workstations.

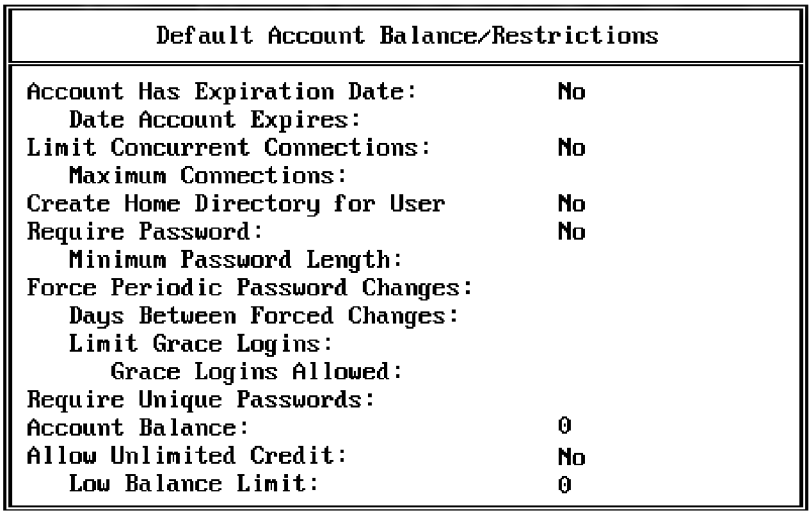
3a Select "Supervisor Options" from the "Available Topics" menu.

The "Supervisor Options" menu appears.

3b Select "Default Account Balance/Restrictions."

If you installed the Accounting feature, the "Account Balance" field appears.

Figure 39 Default Account Balance/Restrictionsscreen

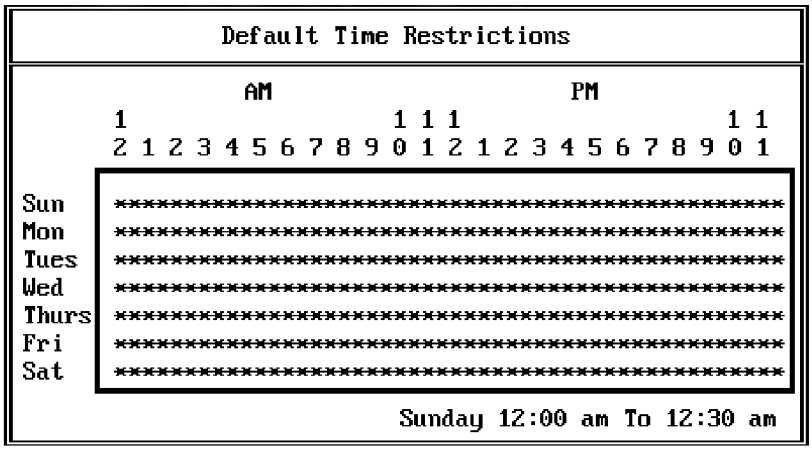


3c Enter the restrictions for your network.

3d Select "Default Time Restrictions" in the "Supervisor Options" menu.

Time is specified in half-hour blocks. To prevent users from logging in during a time block, delete the corresponding asterisk.

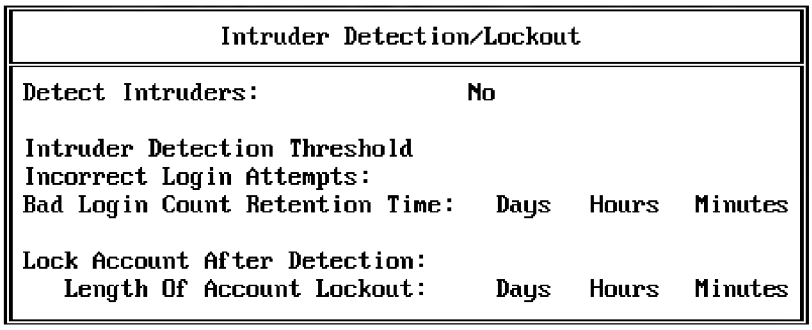
Figure 40 Default Time Restrictions screen



3e Select "Intruder Detection/Lockout" in the "Supervisor Options" menu and change the setting so the system detects intruders.

You must also set the threshold for intruder detection and specify the length of time an account should be locked after an intruder is detected.

Figure 41 Intruder Detection/ Lockout screen



For more information on setting these restrictions, see "SYSCON" in *Utilities Reference*.

3f Press <Esc> to go to the "Available Topics" menu.

4 Create groups

Use the Trustee Directory Security Worksheet, Trustee File Security Worksheet, and Group Worksheet when creating groups. (Users can be added to a group only after both the users and the group have been created.)

If you did not complete the planning worksheets and need help determining the groups to create, "Plan Groups (Optional)" on page 92; see also "Groups" and "Users" in *Concepts*.

If you plan to designate a Workgroup Manager to create users and groups for the workgroup, consider creating only those groups that apply across workgroup boundaries (for example, a group based on an application used by more than one workgroup).

On the other hand, if you plan to designate a group as Workgroup Manager to create users and groups for the workgroup, create the Workgroup Manager group when you create system-wide groups.

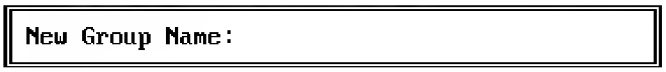
In this case, assign the Supervisory right [S] in a volume or a directory reserved for the workgroup to the Workgroup Manager group.

4a Select "Group Information" from the "Available Topics" menu.

A list of existing groups appears. If no groups have been created, group EVERYONE is the only group on the list.

4b Press <Ins>, type the name of the new group in the entry box, and press <Enter>.

Figure 42 Create a Group screen

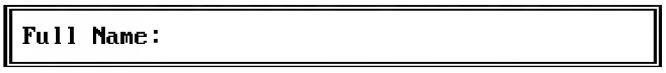


4c Select the group you just created.

4d Select "Full Name" from the "Group Information" menu.

4e Type the full name of the group in the entry box and press <Enter>.

Figure 43 Group Full Name screen



You are returned to the "Group Information" menu.

5 Assign trustee rights.

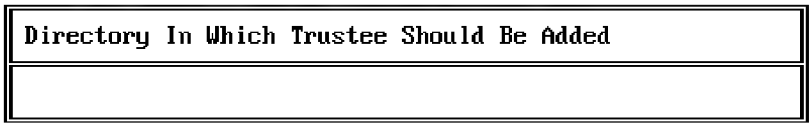
5a To assign trustee rights for the group in a particular directory, select "Trustee Directory Assignments" from the "Group Information" menu.

The "Trustee Directory Assignments" list appears.

5b Press <Ins>.

An entry box appears.

Figure 44 Directory Trustee Assignment screen



5c Enter the complete directory path.

- *If you know the complete directory path*. Type the name of the directory you want the group to have trustee rights in. (Type the complete directory path.) Then press <Enter>.
- *If you do not know the directory path*. You can specify the directory path one level at a time.

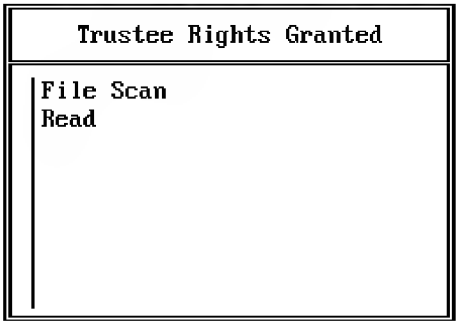
  Press <Ins> and then select volume, directory, subdirectory, and so on. When the directory path appears in the box, press <Esc> and then <Enter>.

  The directory appears in the list of "Trustee Directory Assignments" with the default trustee rights, Read and File Scan [RF].

5d To add rights, press <Enter>.

The "Trustee Rights Granted" list appears.

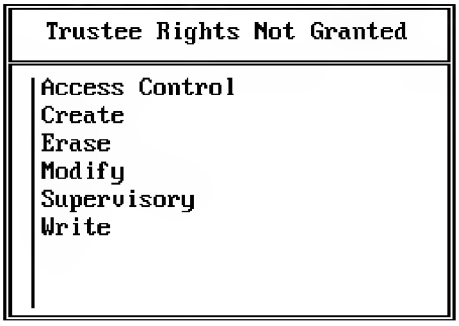
Figure 45 Trustee Rights Granted screen



5e Press <Ins> to view the list of trustee rights not granted.

5f Select the rights you want to grant from this list.

Figure 46 Trustee Rights Not Granted screen



- To add a trustee right, select the trustee right you want.
- To add more than one trustee right, mark each right using the Mark key (<F5> on most machines). Then press <Enter>.

  The trustee directory right or rights you granted now appears on the list of "Trustee Rights Granted." Press <Esc>.

5g Repeat Step 4 through Step 5 to create additional groups and assign their trustee directory rights.

6 Assign trustee file rights.

Use the Trustee File Security Worksheet to remind you what trustee file rights you planned to assign to each group.

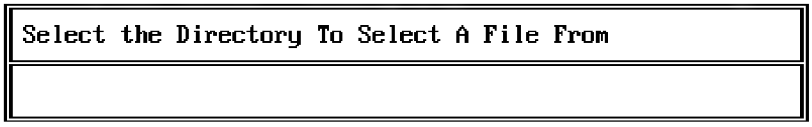
6a To assign trustee rights for the group in a particular file, select "Trustee File Assignments" in the "Group Information" menu.

The "Trustee File Assignments" list appears.

6b Press <Ins>.

An entry box appears.

Figure 47 Select a Directory screen



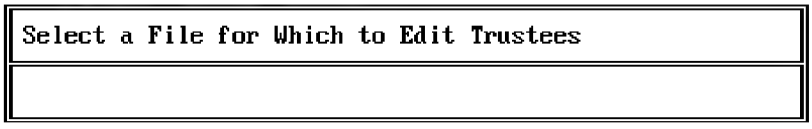
6c Enter the directory path.

- *If you know the directory path*. Type the name of the directory that contains the file you want the group to have trustee rights in. (Type each level of the directory path.) Then press <Enter>.
- *If you do not know the directory path*. You can specify the directory path one level at a time.

  Press <Ins> and then select volume, directory, subdirectory, and so on. When the directory path appears in the box, press <Esc> and then <Enter>.

6d Select the filename.

Figure 48 Select a File screen



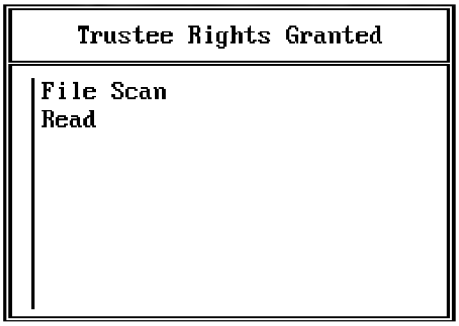
- *If you know the filename*. Type the filename you want the group to have trustee rights to. Then press <Enter>.
- *If you do not know the filename*. Press <Ins> and select the filename from the list that appears. Press <Enter> again.

The filename appears in the list of "Trustee File Assignments" with the default trustee rights, Read and File Scan [RF].

6e To grant additional rights, press <Enter>.

The "Trustee Rights Granted" list appears.

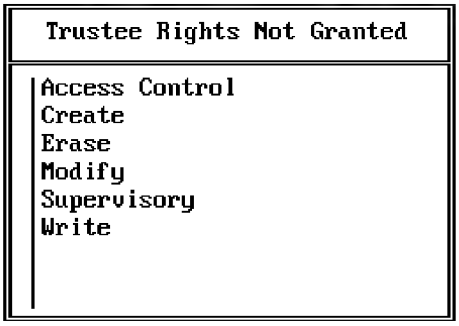
Figure 49 Trustee Rights Granted screen



6f Press <Ins> to view the trustee rights not granted.

6g Select additional rights to grant from this list.

Figure 50 Trustee Rights Not Granted screen



To add a trustee right, select a trustee right from the list.

To add more than one trustee right, mark the rights you want to add using the Mark key (<F5> on most machines). Then press <Enter>.

The trustee file rights you grant appear on the "Trustee Rights Granted" list. Press <Esc>.

6h Repeat Step 6a through Step 6g for each file to which you want to assign trustee rights for a particular group.

7 Create users and set up user accounts.

Use the Users Worksheet as a guide for creating users and setting up their accounts.

You can also use the Trustee Directory Security Worksheet and the Trustee File Security Worksheet to help you make trustee assignments to users.

See the Group Worksheets you completed to assign users to their respective groups.

To delegate the responsibility of creating users and groups to Workgroup Managers, first create Workgroup Managers.

- *To designate a user as a Workgroup Manager*. Create the user and assign the Supervisory right [S] in a volume or a directory reserved for the workgroup. Then skip to Step 11.

  The Workgroup Manager can create users and groups for the workgroup.

- *To designate a group as a Workgroup Manager*. Create the group and the users you plan to assign to the group. Assign the users as members of the group.

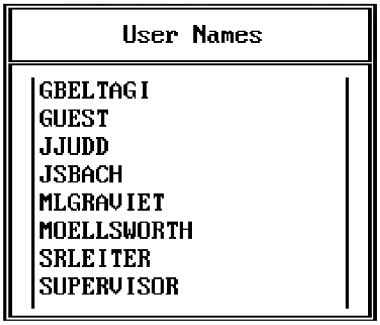
  Assign the group the Supervisory right [S] in a volume or a directory reserved for the workgroup. Then skip to Step 11.

  The members of the group can now create users and groups for the workgroup.

7a Select "User Information" from the "Available Topics" menu.

A "User Names" list appears, similar to the following. (If no users are created, the list contains GUEST and SUPERVISOR.)

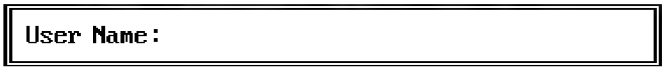
Figure 51 User Names screen



7b Press <Ins> to add a name to the list.

7c Type a username from the list of users you plan to create.

Figure 52 Create a User screen

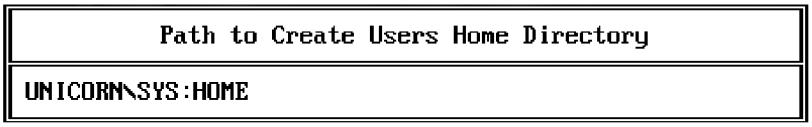


7d Press <Enter>.

The username appears in the "User Name" list.

7e If you have set the system to create a home directory for each user, enter the directory path where all home directories are stored (SYS:HOME, for example).

Figure 53 Create User's Home Directory screen



If you did not set the system to create a home directory, the screen above does not appear.

7f Repeat Step 7b through Step 7e for each user.

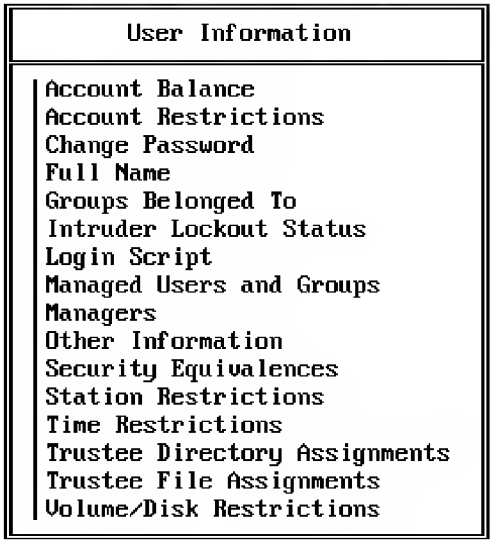
8 Assign password, station, and time restrictions to users.

You must set those options and restrictions for which no system default applies.

If you did not set restrictions at the system level (such as time restrictions), you can set them to apply to particular users.

If you set system defaults, you can remove or assign them for users by selecting options on the "User Information" menu:

Figure 54 User Information menu



8a Select the new username in the "User Names" list.

8b Highlight an option and enter the necessary information.

Refer to the User Defaults Worksheet to make the settings you planned.

A brief explanation of the options in the "User Information" menu, "Plan Individual Account Features" on page 102.

8c After you set the options on the "User Information" menu, press <Esc> to return to the "User Names" list.

8d Repeat Step 8a through Step 8c for each user.

9 Create a username directory for each user.

If you have not created user directories, follow these instructions to create a directory for each user and assign all trustee rights in that directory.

NOTE: You can also use these steps to give directory trustee assignments to users in directories other than their home directories.

To limit disk space after you create the directories, follow the instructions under Step 5.

9a Select the user in the "User Names" list.

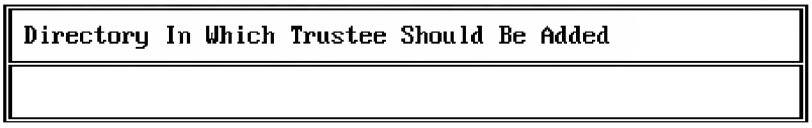
9b Select "Trustee Directory Assignments" from the "User Information" menu.

The "Trustee Directory Assignments" window appears.

9c Press <Ins>.

The following entry box appears:

Figure 55 Directory Trustee Assignment screen



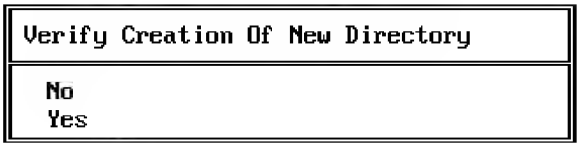
9d For the user you selected, type the complete directory path of the username directory (or directory to make the assignments in). Then press <Enter>.

For example, to create the user's username directory in SYS:HOME, type

SYS:HOME*username* <Enter>

The following box appears:

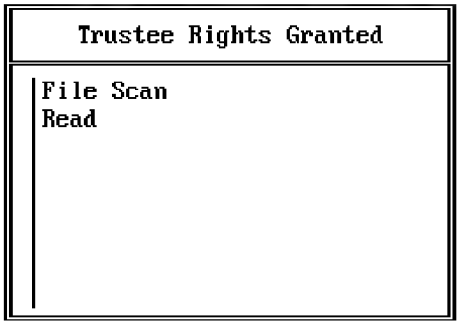
Figure 56 Verify Creation of New Directory screen



9e Select "Yes."

9f Press <Enter> to display the "Trustee Rights Granted" in the directory.

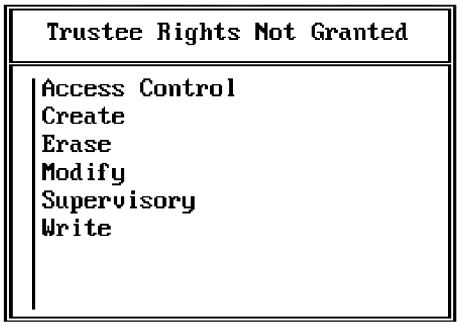
Figure 57 Trustee Rights Granted screen



Default trustee rights are Read and File Scan [RF].

9g Press <Ins> to display the trustee rights *not* granted.

Figure 58 Trustee Rights Not Granted screen



9h Select "Supervisory" to assign the user all rights in the username directory.

The Supervisory right is now displayed in the "Trustee Rights Granted" list.

9i Press <Esc> until you return to the "User Names" list.

9j Repeat Step 9a through Step 9i to create a username directory for each user and to assign the Supervisory right.

10 Add users to groups.

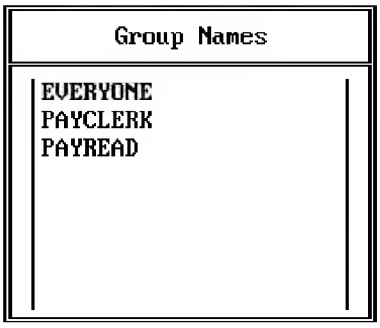
Use the Group Worksheet you completed for each group as a guide when assigning users to a group. Remember that a user can be assigned to a maximum of 32 groups.

10a Press <Esc> until you return to the "Available Topics" menu.

10b Select "Group Information."

A "Group Names" list similar to the following contains the names of the groups you created:

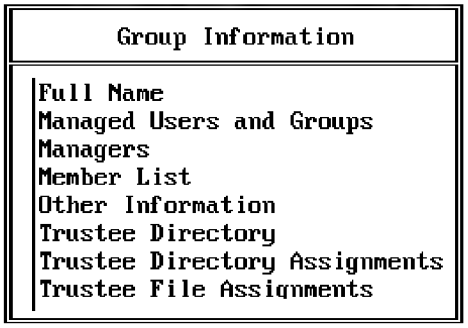
Figure 59 Group Names screen



10c Select the group you want to add members to.

A "Group Information" menu appears for that group.

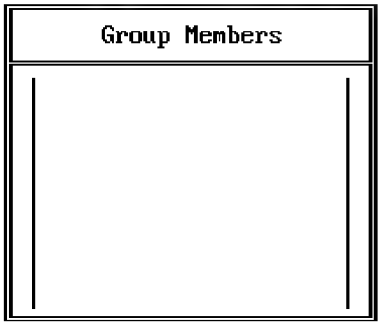
Figure 60 Group Information screen



10d Select "Member List."

The "Group Members" list appears.

Figure 61 Group Members screen



10e Press <Ins> to view a list of users who are *not* members of the group.

Figure 62 Non-Group Member users screen

10f From the list, select the users you want as members of the group.

- To add a member, select the user you want.
- To add more than one member, mark each user with the Mark key (<F5> on most machines). Then press <Enter>.

  The users you added to the group appear in the "Group Members" list.

10g If you have more groups to fill, press <Esc> to return to the "Group Names" menu.

10h Repeat Step 10c through Step 10f for each group you created.

10i To designate Workgroup Managers or User Account Managers, press <Esc> to return to the "Available Topics" menu.

10j To designate a Workgroup Manager, continue with Step 11; to designate a User Account Manager, skip to Step 12.

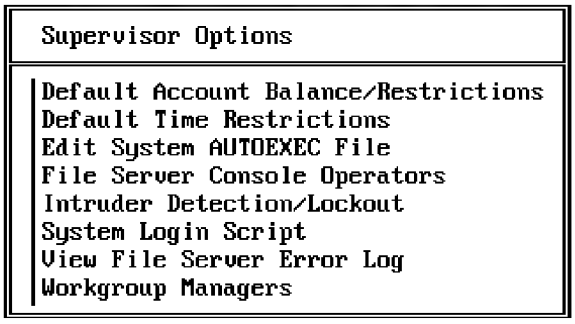
11 (Optional) Designate a Workgroup Manager.

For planning information, "Plan Workgroups (Optional)" on page 90.

11a Select "Supervisor Options" from the "Available Topics" menu.

11b Select "Workgroup Managers" from the "Supervisor Options" menu.

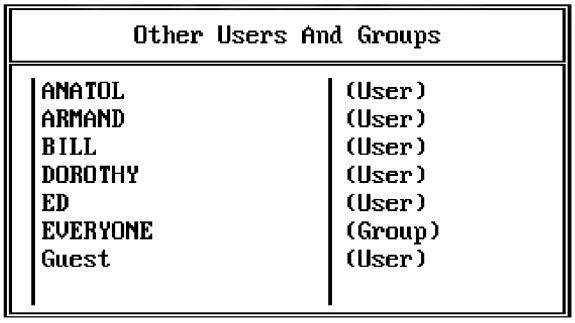
Figure 63 Supervisor Options screen



A list of existing Workgroup Managers appears.

11c Press <Ins> to view a list of "Other Users and Groups."

Figure 64 Other Users and Groups screen



11d Select the user or group you want to designate as Workgroup Manager.

The user or group you selected is now a Workgroup Manager and appears on the "Workgroup Managers" list.

11e Press <Esc> until you can select "User Information" from the "Available Topics" menu.

11f Select a Workgroup Manager.

11g Select "Managed Users and Groups" from the "User Information" menu.

The Workgroup Manager will manage group EVERYONE if the users to be managed are part of group EVERYONE.

11h Press <Ins> and select the users or groups for the Workgroup Manager to manage.

12 (Optional) Designate User Account Managers.

For planning information, "Plan Workgroups (Optional)" on page 90.

12a Select a User Account Manager.

- *If you are a user*. Select "User Information" from the "Available Topics" menu. A list of existing users appears. Select a user.
- *If you are a member of a group*. Select "Group Information" from the "Available Topics" menu. A list of existing groups appears. Select a group.

12b Assign users or groups to the User Account Manager.

12c Select "Managed Users and Groups" from either the "User Information" or "Group Information" menu.

The list for "Managed Users and Groups" appears.

12d Press <Ins> to view a list of "Other Users and Groups."

12e Select the users or groups you want to assign to the User Account Manager.

You can assign groups if all group members are assigned to the same User Account Manager.

Where to Go From Here

To	See
Continue the installation	"Create Login Scripts" on page 145.
Install a print server	Print Server
Set up workstations to do file server commands	"Remote Management" in *System Administration*
Run NetWare v3.x utilities on a NetWare v2.x file server	Utilities Reference
Customize directory structure, user, or group information	These commands in *Utilities Reference*: "ENABLE TTS" "FILER" "FLAG" "FLAGDIR" "GRANT" "MAKEUSER" "RIGHTS" "SETTTS" "SYSCON" "USERDEF"

6 Create Login Scripts

Login scripts set up workstation environments when users log in. Login scripts are similar to configurable batch files and are executed by the LOGIN utility.

You can use login scripts to

- Map drives and search drives to directories.
- Display messages.
- Set environment variables.
- Execute programs or menus.

Some login script commands that apply to DOS workstations don't apply to OS/2 workstations. These differences are indicated in the description of each command in this chapter.

Plan Login Scripts

When a user logs in, LOGIN executes login scripts, similar to an AUTOEXEC.BAT file. Three types of login scripts are available:

- *System login script.*Sets general environments for all users. This script executes first.
- *User login script.* Sets environments for a user, such as menu options or a username for electronic mail. This script executes after the system login script.
- *Default login script.*(Part of LOGIN.) This script executes the first time you log in as user SUPERVISOR. It contains essential commands such as a drive mapping to NetWare utilities.

To see the commands in this default script, "Default Login Script" on page 185.

The default login script also executes for a user who doesn't have a user login script. We recommend using the default login script only temporarily.

An example of a system login script appears on "System Login Script" on page 187, and a user login script example appears on "User Login Script" on page 189.

Decide Which Login Scripts to Create

Maintaining many user login scripts is time consuming. Therefore, include as much customizing information as possible in the system login script, which is easier to maintain.

For example, if all users need access to NetWare utilities in the same volume, place the search drive mapping to that volume in a single system script rather than in every user script.

In user login scripts, include only those items that can't be included in system scripts.

Since two login scripts can execute when a user logs in, conflicts can occur.

Because the system login script executes first, if you map the same drive letter or number in both login scripts, the mapping in the user login script overwrites the mapping in the system login script.

Therefore, create a system login script before you create the user login script, so you know which drives are available.

Plan Login Script Conventions

Login scripts require the command formats specified later in "Hints" on page 151.

A command format provides patterns for using key words, options, variables, spacing, delimiters or other characters, and punctuation.

Any identifier variables enclosed in quotation marks must be uppercase and must be preceded by a percent (%) sign.

Command lines cannot exceed 150 characters.

Press <Enter> at the end of each command and start the next command on a new line. Each command must be on its own line.

For additional information and examples, see "Login Script" in *Concepts*.

Plan a System Login Script

You can use the following categories to organize your system login script. The commands are listed and explained on "Login Script Commands and Variables" on page 155 and sample scripts are listed in "Sample user login script" on page 189.

- *Preliminary commands*. To use either of the following commands, place them at the beginning of a login script (commands that can be set to ON or OFF can be used more than once in a script):

  DOS BREAK ON|OFFMAP DISPLAY ON|OFF

- *Greetings*. Display brief messages on user screens with

  WRITE "message"

- *Display login messages*. Use the following commands with the filename to display text files:

  FDISPLAY *filename*DISPLAY *filename*

  When you display text files, type "PAUSE" on the next line so users can read the text at their own pace.

- *Attach to other file servers*. For all users to attach to another file server, include ATTACH with the file server name.

  ATTACH *server*

  If you form groups on the basis of which file servers users need to attach to, you can use the conditional IF ... THEN with ATTACH.

  IF MEMBER OF "*groupname*" THENATTACH *server*END

- *NetWare utilities mapping*. Include at least the following drive mapping to access NetWare utilities:

  MAP S1:=SYS:PUBLIC

- *DOS directory mapping and COMSPEC*. Include the following commands if users need to run DOS from the network:

  MAP INS S2:= *DOS directory*COMSPEC =S2:COMMAND.COM

COMSPEC should specify the same search drive that is mapped to the DOS directory.

For examples, see "DOS Directories" in *Concepts*.

- *Application directory mappings*. Map a search drive to each application directory that users or groups need access to.

```
MAP S16:=SYS:APPL\WORDPROCMAP S16:=SYS:APPL\SPREADSH
```

If you formed groups on the basis of application use, use the IF ... THEN conditional to provide only that group with the mapping.

If you use IF ... THEN to provide a group with two or more mappings, you must also use BEGIN ... END.

```
IF MEMBER OF "groupname" THEN BEGINMAP
  S16:=SYS:APPL\WORDPROCMAP S16:=SYS:APPL\SPREADSHEND
```

Put the series of mappings in the order of frequent use. List the most frequently used application group first and the least frequently used application group last.

- *Miscellaneous search drive mappings*. Use the MAP command (with or without the conditional IF ... THEN) to include a search drive mapping to any directory where batch files or third-party utilities are stored.
- *Supervisor mappings*. To provide mappings to SYS:SYSTEM and other supervisor directories, complete the following IF ... THEN conditional:

```
IF LOGIN_NAME="SUPERVISOR" THENMAP
  S16:=SYS:SYSTEM[commands]END
```

- *Home or username directory mapping*. Include a generic mapping (using the identifier variable, *%LOGIN_NAME* for the directory name) to the home or username directory.

We suggest that you map the first network drive to the home or username directory.

The first network drive is usually F:, but if you have workstations that require some other drive letter as the first network drive, use *1 as a generic first network drive.

```
MAP *1:=SYS:HOME\%LOGIN_NAME
```

If you want users at a drive other than the default drive when they exit the login script, use the DRIVE command:

```
DRIVE drive: | *n:
```

- *Data or work directory mapping*. Include mappings to data or work directories.

  If you formed groups on the basis of job responsibilities or information needs, use the IF ... THEN conditional to provide only that group with the mapping.

- *Default printer mappings or printing batch files*. If you formed groups on the basis of print queues, you can use the IF ... THEN conditional with #CAPTURE and a queue specification.

  ```
  If MEMBER of "groupname" THEN#CAPTURE S=server
    Q=printqueue
  ```

  Or you can call up batch files to provide printer or print queue routing.

- *Display directory path at prompt*. To display the directory path at the prompt, include the DOS PROMPT command (or include the command in your AUTOEXEC.BAT file).

  ```
  SET PROMPT="$P$G"
  ```

- *Display drive settings*. If you want drive mappings displayed for users, include the following commands:

  ```
  MAP DISPLAY ONMAP
  ```

- *Run miscellaneous programs*. To execute an external program (a filename with a .BAT, .COM, or .EXE extension), use the pound (#) sign preceding the name of the executable file.

  The pound sign (#) allows both external execution and then a return to continue the login script. #COMMAND /C filename will also execute a DOS batch file.

  You can also run an executable file from an EXIT command. (However, if you use an EXIT command in a system login script, the user login script will not run.)

For a sample system login script, "System Login Script" on page 187.

Plan User Login Scripts

A user login script contains commands that

- Map network drives used only by an individual user.
- Initialize environmental variables for the individual user.
- Exit to or call up menus (optional).

A user's login script executes after the system login script and customizes the environment for that user.

If you have accomplished your main purposes in the system login script, you need only minimal user login scripts.

Users can modify their own login scripts in SYSCON if you allow them to change their own passwords.

Using SYSCON, you can copy login scripts from one user to another and then modify the copied login script to customize it.

A user login script contains the same kinds of commands that are used in the system login script, but a user login script contains commands that apply only to an individual user.

You can map drives to directories individuals frequently use.

Don't use the same numbered search drives as the system login script.

If you do, search mappings created by the system login script are overwritten, and the COMSPEC command (which requires the same search drive mapped to DOS directories) won't work.

Use the MAP INS command to prevent overwriting mappings.

Use the DOS SET command to set application environment variables that apply to individual users.

Whatever can be set in the AUTOEXEC.BAT file can be set in the user login script. For more information and examples, see "Login Script" in *Concepts*.

If you create a menu for users to access applications and programs, you can call up the menu from the user login script. For more about menus, see "NMENU" in *Utilities Reference*.

IMPORTANT: If you use the EXIT command in the system login script, user login scripts will not execute.

- *Application environment variables*. Consult the documentation that accompanies the applications you plan to install on the network.

  Determine which user variables can be set with the DOS SET command and how they should appear in the login script.

- *Individual search drive mappings*. If a user uses a directory containing executable files, and the mapping isn't in the system login script, include a search drive mapping for that user to the directory. Example:

```
MAP S16:=SYS:APPL\SPREADSH
```

- *Individual drive mappings*. If a directory is frequently used by only one user, plan a drive mapping for that user to the directory. Example:

  ```
  MAP g:=SYS:PROJECTS\CURRENT
  ```

- *Execute a menu*. You can exit to a menu from the login script using EXIT as the last command in the user login script. (To create menus, see "NMENU" in *Utilities Reference*.)

  The string that follows an EXIT command must be 14 characters or fewer.

  The menu script file (for example, ACCOUNT.MNU or PAYCLERK.MNU) must be stored in a directory to which a search drive has been mapped.

  You can include commands similar to the following:

  ```
  EXIT "MENU account"
  ```

  or

  ```
  IF MEMBER OF "PAYCLERK" THENEXIT "MENU payclerk"
  ```

  Or you can also exit to a batch file:

  ```
  EXIT "COMMAND /C GO"
  ```

  In the GO.BAT file, type

  ```
  MENU payclerk^Z
  ```

  The GO.BAT file should also be stored in a directory to which a search drive has been mapped.

For a sample user login script, "Sample user login script" on page 189.

Creating, Modifying, and Copying Login Scripts

Use SYSCON to create or modify login scripts and to copy one user's login script to another.

Hints

System and user login scripts use the same conventions, commands, and variables. The following hints will help you plan effective login scripts.

For a description of the commands you can use in a login script, see "Login Script Commands and Variables" on page 155.

For variable information, "Identifier Variables" on page 182.

Table 11 Login script conventions

Subject	Convention
Blank lines	Blank lines don't affect script execution. Use them to visually separate groups of commands.
Case	Either uppercase or lowercase is accepted. Exception: identifier variables enclosed in quotation marks must be preceded by a percent sign (%) and must be uppercase. "Identifier Variables" on page 181
Characters per line	150 characters per line maximum; 78 (common screen width) is recommended for readability.
Commands per line	Use only one command per line. Start each command on a new line and press <Enter> at the end of each command. Lines that wrap automatically are considered one command. WRITE commands display better if the command WRITE is repeated at the beginning of each line.
Identifier variables	Type identifier variables exactly as shown. Identifier variables that you want displayed on the workstation's screen as part of a WRITE command should be enclosed in quotation marks, preceded by a percent sign (%), and typed in uppercase letters. "Identifier Variables" on page 181
Minimum script	No minimum. Both types of scripts are optional. Scripts can have one line or many. There are no required commands for scripts.
Punctuation and symbols	Type symbols (#, %, ", _) and punctuation exactly as shown in examples and syntax.
Remarks (REMARK, REM, asterisks, and semicolons)	Lines beginning with REMARK, REM, an asterisk, or a semicolon are comments and do not display when the script executes. Use remarks to record the purpose of each command or group of commands. (See "REMARK" on page 174

Subject	Convention
Sequence of commands	Generally, enter commands in the order you want them to execute, with the following restrictions: Enter commands with ON|OFF switches at the beginning of the script. ATTACH commands must precede related MAP commands. If you use "#" to execute an external program, it must follow necessary MAP commands. If sequence is not important, group similar commands, such as MAP and WRITE commands, together to make the script easier to read.

Create the System Login Script

Procedure

1. At the command line type**SYSCON <Enter>**
2. Select "Supervisor Options" from the "Available Topics" menu.
3. Select "System Login Scripts" from the "Supervisor Options" menu.

   An empty "System Login Script" box appears.
4. Type the login script commands for your system login script (see "Plan Login Scripts" on page 145).
5. When you finish entering the commands, press <Esc> and then <Enter> to save your changes.
6. Press <Esc> again to return to the "Available Topics" menu.

Create User Login Script

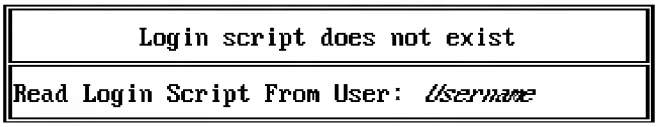
Procedure

1. At the prompt, type**SYSCON <Enter>**
2. Select "User Information" from the "Available Topics" menu.

   The "User Names" list appears.
3. Select a username.
4. Select "Login Script" from the "User Information" menu.

The following screen appears:

Figure 65 Create or copy a login script screen



4a To copy a login script from another user, type the name of the user whose login script you want to copy or press <Insert> to select the user from the list.

The login script appears in the screen.

4b To create a new login script, press <Enter>.

A user login script box appears.

5 Enter the drive mappings, environment variables, and other login script commands you want for the user (excluding those in the system login script).

6 When you finish entering the commands, press <Esc>. Press <Enter> to save the login script changes. Then press <Esc> again to return to the "User Names" list.

7 Repeat "Select "User Information" from the "Available Topics" menu." on page 153 through "When you finish entering the commands, press <Esc>. Press <Enter> to save the login script changes. Then press <Esc> again to return to the "User Names" list." on page 154 to create a login script for each user.

Login Script Commands and Variables

The following login script commands are described in alphabetical order on the following pages:

#	GOTO
ATTACH	IF ... THEN
BREAK	INCLUDE
COMSPEC	MACHINE
DISPLAY	MAP
DOS BREAK	PAUSE
DOS VERIFY	PCCOMPATIBLE
DRIVE	REMARK
EXIT	SET
FDISPLAY	SHIFT
FIRE PHASERS	WRITE

Syntax conventions for login script commands are the same as those for workstation text utilities. The following is an example of the syntax for the MAP login script command:

MAP [*option*] *drive*:=[*drive*:|*path*]

For a table of command syntax conventions, see "Command syntax conventions" on page 156.

Table 12 Command syntax conventions

Convention	Explanation
MAP	Words in uppercase letters are keywords that must be included in the command and spelled exactly as shown. However, you can type them in uppercase or lowercase letters.
[ ]	Square brackets indicate that the enclosed item is optional.
|	A vertical bar means you can use either the item to the left of the bar, or the item to the right, but not both. In the MAP example, you can enter either the drive letter or a complete path.
drive:	Words in italics are variables. Replace variables with information specific to your task.
[*option*]	Options for each command are listed with the command. Options can often be abbreviated.
<Enter>	Angle brackets indicate a key you should press.
[[ ]]	Nested square brackets indicate that all enclosed items are optional. However, if you use the items within the inner brackets, you must also use the items within the outer brackets.
\	A backslash is used to separate filenames in a path statement. Although the backslash is the convention, it doesn't matter if you use a forward slash; either is accepted. However, if you use a command line option (/s, for example) the forward slash *must* be used.

(Execute External Program)

Use this command to execute a program that is external to the login script.

Command Format

```
# [path] filename [parameter]
```

Replace *path* with either a drive letter or a full directory path beginning with the NetWare volume name.

Replace *filename* with an executable file (files that end in .EXE, .COM, or .BAT, for example), excluding the extension.

Replace *parameter* with parameters that must accompany the executable file.

Using

Enter the # command after MAP assignments, so that the program executes using the correct drive mappings.

The login script is held in memory when the # command is run. The script is not released until you return to the login script and either complete it or exit it.

Examples

To print from an application not designed to print on a network, include CAPTURE in your login script, which allows you to send print jobs to a network print queue (QUEUE1 in this example):

```
#CAPTURE Q=QUEUE1 NB TI=10 NFF
```

You do not need to enter a path in this case because CAPTURE is located in SYS:PUBLIC, and the system login script should have a search drive mapped there.

If you do not have a search drive mapped to a directory, you must include the path to that directory in the command.

For example, to run a batch file named BATCH.BAT in the ACCOUNTS directory, use the following command:

```
#SYS:ACCOUNTS\BATCH
```

ATTACH

Use ATTACH to connect to NetWare servers while the login script is running.

Command Format

ATTACH [*server*[*username*]]

Using ATTACH

Replace *server* with the name of the server you want to attach to.

Replace *username* with the login name.

If you do not include the username, the system assumes the username on the current server. To log in with a different username, include it in the ATTACH command as in the following example.

Example

To attach to a server called REPORTS as user MRICHARD, add the following line to your login script:

```
ATTACH REPORTS\MRICHARD
```

BREAK

Use BREAK ON to allow you to terminate the execution of your login script. The default is BREAK OFF.

Command Format

```
BREAK ON|OFF
```

Using BREAK

If BREAK ON is in your login script, you can press <Ctrl><C> or <Ctrl><Break> to abort the normal execution of your login script.

Including BREAK ON in your login script does not affect the DOS <Ctrl><Break> check. For more details, "DOS BREAK" on page 160.

When the BREAK option is ON, type-ahead keyboard input is not saved in the buffer.

COMSPEC

If users run DOS from the network, use COMSPEC in the login script to specify the directory where DOS and the command processor (COMMAND.COM) are loaded.

Users running OS/2 should not use this command in the login script (see "Using COMSPEC with OS/2" on page 159).

Command Format

```
COMSPEC = [path]COMMAND.COM
```

Replace *path* with either a drive letter or a full directory path beginning with the NetWare volume name.

Using COMSPEC

If users run DOS from a network directory, first map a search drive in the login script to that directory, then add the COMSPEC command to the script.

You may want to map a fake root to the DOS directory. (See "Fake root" in *Concepts*, or "MAP" in *Utilities Reference*.)

If all users use the same version of DOS from the network, add the COMSPEC command to the system login script.

If more than one version of DOS is available on your network, a network directory should exist for each DOS version.

In this case, put COMSPEC commands in user login scripts to make sure each workstation accesses the version of DOS it needs.

If users run DOS from their local drives, do not add COMSPEC to login scripts. Instead, users add COMSPEC to their AUTOEXEC.BAT files.

Using COMSPEC with OS/2

If all users are running OS/2, do not include the COMSPEC variable in a login script.

A user running a DOS session from an OS/2 workstation must include a COMSPEC statement in his or her CONFIG.SYS file (instead of the login script) to point to COMMAND.COM on a local hard disk.

If you have both DOS and OS/2 users that execute the same login script, include the COMSPEC command in the script.

However, OS/2 users must then reset the COMSPEC variable after they log in (from the command line or in a batch file).

Example

If you mapped a search drive to the DOS directory on the network, you can use the search drive number or drive letter in the COMSPEC command.

For example, if the second search drive (S2:, which maps to drive letter Y:) in the login script is mapped to the DOS directory, either of the following COMSPEC commands will work in the login script:

```
COMSPEC=S2:\COMMAND.COMCOMSPEC=Y:\COMMAND.COM
```

For more about OS/2 workstations, see Workstation for OS/2.

DISPLAY

Use DISPLAY to show the contents of a text file on a workstation's screen when the user logs in. This command works best with an ASCII file.

If you use DISPLAY with a word-processed file, printer and word-processing codes are displayed with the text. To display a word-processed file, "FDISPLAY" on page 163.

Command Format

```
DISPLAY [path] filename
```

Replace *path* with either a drive letter or a full directory path beginning with the NetWare volume name.

Replace *filename* with the complete name of the file you want to display.

Example

You put messages in a file called SYSNEWS.TXT, in the directory SYS:PUBLIC\MESSAGES, and you want your users to see this file on their screens when they log in on Mondays.

Add the following lines to the system login script:

```
IF DAY_OF_WEEK = "Monday" THENDISPLAY
  SYS:PUBLIC\MESSAGES\SYSNEWS.TXT
```

DOS BREAK

Use DOS BREAK to set the <Ctrl><Break> checking level for DOS. If the DOS BREAK command is set to ON, you can terminate a program (other than the login script) by pressing <Ctrl><Break>.

This command does not apply to OS/2 workstations.

This command is different from the BREAK command that terminates the login script. "BREAK" on page 158 for more details.

Command Format

```
DOS BREAK [ON|OFF]
```

Using DOS BREAK

Enter the following command in the login script:

```
DOS BREAK ON
```

The default is DOS BREAK OFF.

DOS VERIFY

Use DOS VERIFY to verify that data copied by the DOS COPY command to a local drive can be read without an error.

If you do not use DOS's COPY command (for example, if you use NetWare's NCOPY utility instead), you do not need to use this login script command.

Command Format

```
DOS VERIFY [ON|OFF]
```

Using DOS VERIFY

The DOS COPY command, unlike the NetWare NCOPY utility, does not automatically verify that data copied to a local drive can be read after the copy.

To make COPY verify success the same way NCOPY does, add the DOS VERIFY ON command to the login script.

This command may not work with some software that is copy protected.

The default is DOS VERIFY OFF.

DRIVE

Use DRIVE to specify your default drive.

Command Format

```
DRIVE [drive:|*n:]
```

Replace *drive* with a local or network drive letter, or replace *n* with a drive number.

Using DRIVE

Unless this command is in your login script, your default drive is set to the first network drive, which is often assigned to your home directory when you log in.

If you do not want your default drive to be the first network drive, map a drive in your login script to the directory you want to be your default.

After that MAP command, enter the DRIVE command in your login script.

You can specify drive letters such as F: or G:, or you can use an asterisk followed by a number *n* to represent the *n*th network drive (for example, *3).

This allows drive letters to reorder themselves automatically if previous drive mappings are deleted or added.

Example

You expect to work on only one project for several days and the files for that project are located on drive S:.

You can use the DRIVE command to set your default drive to S: so you won't have to change your default drive every time you log in.

First, make sure you've mapped drive S: to the correct directory in your login script. Then enter the following command in the script:

```
DRIVE S:
```

EXIT

Use EXIT to terminate execution of the LOGIN utility and execute an external program.

Command Format

```
EXIT ["filename"]
```

Using EXIT

You can also use EXIT in an IF...THEN statement, so that the script stops and exits to an external program if a certain condition exists.

If the condition doesn't exist, the script skips the EXIT command and continues executing.

If you add EXIT at the end of a system login script, it prevents user login scripts from running.

EXIT only works on IBM PCs and compatibles, and on workstations running OS/2.

Therefore, if you use DOS and your workstation doesn't have the IBM_PC machine name, add the PCCOMPATIBLE login script command to the script.

You can change the workstation's machine name in the NET.CFG file.

Examples

You are running DOS and your long machine name is IBM_PC. You want to execute a menu program called TRAINING when the login script is finished. Add the following at the end of the login script:

```
EXIT "MENU TRAINING"
```

You are running DOS on a Hewlett Packard computer and you have changed the long machine name to HE_PAC in the NET.CFG file. Add the following lines at the end of the login script:

```
PCCOMPATIBLEEXIT "MENU TRAINING"
```

You want your login script to exit to WordPerfect when you log in on Mondays, but not on other days. Add the following IF...THEN statement to your login script:

```
IF DAY_OF_WEEK = "MONDAY" THEN EXIT "WP"
```

FDISPLAY

Use FDISPLAY to show the text of a word-processed file on a workstation's screen when the user logs in.

To display both the text and the printer and wordprocessing codes of a file, or to display an ASCII file, "DISPLAY" on page 160.

Command Format

```
FDISPLAY [path] filename
```

Replace *path* with either a drive letter or a full directory path beginning with the NetWare volume name.

Replace *filename* with the complete name of the file you want to display.

Using FDISPLAY

When you use FDISPLAY to display the contents of a word-processed file on the screen when a user logs in, the text in the file is filtered and formatted so that only the text itself is displayed.

FDISPLAY will not display tabs.

If the given directory does not exist or if the file is not found, no error message appears on the screen when the user logs in.

Example

You put messages in a file called SYSNEWS.TXT, in the directory SYS:PUBLIC\MESSAGES, and you want your users to see this file on their screens when they log in on Mondays.

Add the following lines to the system login script:

```
IF DAY_OF_WEEK = "Monday" THENFDISPLAY
  SYS:PUBLIC\MESSAGES\SYSNEWS.TXT
```

FIRE PHASERS

Use FIRE PHASERS to emit a phaser sound when certain conditions exist.

Command Format

```
FIRE PHASERS n TIMES
```

Replace *n* with the number of times (up to nine) that you want to hear this sound.

Using FIRE PHASERS

Use this command by itself to hear the phaser sound whenever a user logs in.

Use FIRE PHASERS with the IF...THEN command to make the sound execute a different number of times depending on the circumstances of the login.

Examples

The following will execute the phaser sound four times when you log in:

```
FIRE PHASERS 4 TIMES
```

The following lines will fire the phasers five times on Thursdays:

```
IF DAY_OF_WEEK = "Thursday" THENFIRE PHASERS 5 TIMES
```

For more information about using identifier variables such as DAY_OF_WEEK, "Identifier Variables" on page 181.

GOTO

Use GOTO to execute a portion of the login script out of the regular sequence.

Command Format

```
GOTO label
```

Use *label* to indicate where you want to continue executing the login script.

Using GOTO

Set BREAK ON in your login script before experimenting with GOTO loops so that you can break out of a script if necessary.

For more about BREAK, "BREAK" on page 158.

IMPORTANT: Do not use GOTO from within a nested IF...THEN statement.

Example

To execute a loop of commands, include the following lines in your script. In this case, the commands to be executed are labeled LOOP (indicated on the second line).

```
SET X = "1"LOOP:SET X = <X> + "1";see compound strings for
  thisWRITE <X>IF <X> < "10" THEN GOTO LOOP
```

<X> is a DOS environment variable that is incremented with each loop. Remember to allow IF...THEN commands to wrap to the next line if there is not enough room on one line.

IF...THEN

Use IF...THEN when you want the login script to perform an action only under certain conditions.

Command Format

```
IF conditional [AND|OR [conditional]] THEN command[ELSE
  command] [END]
```

Replace *conditional* with identifier variables ("Identifier Variables" on page 181).

Replace *command* with login script commands you want to execute if the specified condition is true.

Using IF...THEN

Use IF...THEN to execute commands only under certain conditions.

For example, if you want special messages to appear on the screen on certain days of the week, use IF...THEN to accomplish this. When using IF...THEN, be aware of the following syntax rules:

- Use "AND" or "OR" to include two or more conditionals in an IF...THEN statement.
- Enclose values of conditional statements in quotation marks.
- The ELSE statement is optional.
- IF, ELSE, and END must be on separate lines. THEN does not need to be on a separate line.
- If you include a WRITE command as part of an IF...THEN command, the WRITE command must be on a separate line.
- IF...THEN statements can be nested (up to 10 levels).
- If your IF...THEN statement consists of only one line, even if that line wraps, you do not need to include END.

  If your IF...THEN statement must be on more than one line (for example, you used ELSE or WRITE, which must be on separate lines), you must include END.
- If your IF ... THEN statement contains two or more consecutive commands, you must use END.
- Use only one END statement per IF...THEN. Once an END statement is encountered, evaluation of the current IF...THEN is terminated, regardless of what follows.

An example of a conditional statement:

```
IF MEMBER OF "CLERKS"
```

In this statement, some action will be performed if the user who logged in belongs to the group named CLERKS.

The following is a different type of conditional statement:

```
IF DAY_OF_WEEK = "MONDAY"
```

In this statement, the equals sign (=) indicates the relationship between the variable (DAY_OF_WEEK) and its value (Monday). Note that the value (Monday) is inside quotation marks.

Six relationships are possible between the information contained in an IF...THEN statement. You can represent these relationships using the following symbols:

Symbol	Definition
=	Equals
<>	Does not equal
>	Is greater than
>=	Is greater than or equal to
<	Is less than
<=	Is less than or equal to

Examples

If you have the following command in your login script, you see "Status report is due today" when you log in on Monday and "Have a nice day!" on other days.

```
IF DAY_OF_WEEK = "MONDAY" THENWRITE "Status report is due
  today"ELSEWRITE "Have a nice day!"END
```

The following line means "If the hour (on a 24-hour scale) is greater than or equal to 12, then write `afternoon'."

```
IF HOUR24 >= "12" THENWRITE "afternoon"END
```

The following command executes the CAPTURE utility on the fourth day of the week (Wednesday):

```
IF NDAY_OF_WEEK = "4" THEN#CAPTURE Q=FAST_Q NB TI=10 NFF
```

The following example shows nested IF...THEN statements. Notice that there are two IF statements, so each one must have its own END statement.

```
IF DAY_OF_WEEK = "MONDAY" THENIF MEMBER OF "CLERKS"
  THENWRITE "Your report is due immediately!"ENDEND
```

Conditionals can be joined with commas, the word AND, and the word OR to form compound conditionals.

The first line of the following IF...THEN statement is a compound conditional that means "If it is the morning of the first day of the month":

```
IF GREETING_TIME="MORNING" AND DAY="01" THENWRITE "The
  system will be backed up tonight."END
```

The following line is a compound conditional that means "If it is 11:59:59 p.m.":

```
IF HOUR24="23", MINUTE="59", AND SECOND="59"
```

An IF...THEN statement can include several commands that must be executed if the conditional is true.

The following example shows two commands that are executed on Tuesdays: a WRITE command that displays a message about a staff meeting, and an INCLUDE command that tells the login script to process any commands or messages contained in the file SYS:PUBLIC\UPDATE.

```
IF DAY_OF_WEEK = "TUESDAY" THENWRITE "Staff meeting today
  at 10 a.m."INCLUDE SYS:PUBLIC\UPDATEEND
```

For more information about identifier variables, "Identifier Variables" on page 181.

INCLUDE

Use INCLUDE to execute a subscript as a part of the login script.

Subscripts can be text files that contain any of the commands explained in this section. A subscript can also be a login script that belongs to a different object.

Command Format

```
INCLUDE [path] filename
```

To use a text file as a subscript, replace *path* with either a drive letter or a full directory path beginning with the NetWare volume name. Replace *filename* with the complete text file name.

Using INCLUDE

You can create and edit text-file subscripts using any text editor or word processor. Subscripts do not need any particular filenames or extensions.

INCLUDE nesting is limited only by memory. This means that one script file can include another script file, which can include yet another script file, and so on.

You must have at least File Scan and Read rights in the directory containing a subscript you want to use.

Examples

To execute a text file called SCRIPT.NEW (located in volume VOL1:) as a subscript, add the following line to your main login script:

```
INCLUDE VOL1:ADMIN\USERS\SCRIPT.NEW
```

MACHINE

Use MACHINE to set the DOS machine name (such as IBM_PC or HE_PC) of the workstation. This command does not apply to OS/2 workstations.

Command Format

```
MACHINE = name
```

Using MACHINE

The machine name can be up to 15 characters. (Longer machine names are truncated to 15 characters.)

MACHINE is necessary for some programs (such as NETBIOS) written to run under PC DOS. The name can include such identifier variables as STATION.

For information about setting machine names in the NET.CFG file, see Appendix B, "NET.CFG File Parameters" in *Workstation for DOS and Windows*. For information about using identifier variables, see "Identifier Variables" on page 181.

MAP

Use MAP to map drives and search drives to network directories.

Command Format

```
MAP [option] drive:=[drive:|path]
```

Replace *drive* with a valid network drive letter, local drive letter, or search drive number.

Replace *path* with either a drive letter or a full directory path.

When mapping a drive to a directory on your current server, begin the path with the volume name.

When mapping to a directory on a server that isn't your current server, begin the path with the server's name.

Replace *option* with one of the following:

- *DISPLAY ON/OFF:* Determines whether drive mappings are displayed on the screen when the user logs in. The default setting is ON. (Valid only in login scripts.)
- *ERRORS ON/OFF:* Determines whether MAP error messages are displayed when the user logs in.

  MAP ERROR OFF must be placed before MAP commands in the login script. The default setting is ON. (Valid only in login scripts.)
- *INS:* Inserts a drive mapping between existing mappings. (Valid only in login scripts and at the command line.)
- *DEL:* Deletes a drive mapping, making that drive letter available for other mapping assignments. (Valid only in login scripts and at the command line.)
- *ROOT:* Maps a fake root. Some applications require their executable files to be located in a root directory.

  Since you may not want users to have rights at the root directory, you can map a fake root to a subdirectory instead. (Valid only in login scripts and at the command line.)
- *N (Next):* When used without specifying a drive number or letter, maps the next available drive. (Valid only in login scripts and at the command line.)

Using MAP

Use MAP to save drive mappings in a login script so that users don't have to remap drives to directories every time they log in.

Specify drive mappings in a login script by entering the same commands that you would enter if you were using MAP at the command line.

These mappings are displayed when you log in, unless you put MAP DISPLAY OFF in your login script.

You can specify drive letters such as F: or G:, or use an asterisk followed by a number *n* to represent the *n*th network drive (for example, MAP *3:=).

This allows drive letters to reorder themselves automatically if previous drive mappings are deleted or added.

This also allows users to log in from workstations with a different number of local drives than their regular workstation.

You can map a local drive (usually A: through E:) to a network directory, but you cannot access the local drive until you remove the network drive mapping.

Mapping Search Drives

For DOS and Windows workstations, you can map search drives to directories that contain applications, executable files, etc.

Then DOS and Windows users can execute those applications regardless of the directory they are working in.

NOTE: OS/2 workstations cannot use search drives. Instead, OS/2 users use the OS/2 commands PATH, DPATH, and LIBPATH in their CONFIG.SYS files.

When you map a search drive, use a search drive number (an S followed by a number).

This search drive number assigns the next available drive letter to the mapping, starting with Z: and working backwards.

You can map search drives in the following order:

- Map the first search drive (S1:) to SYS:PUBLIC, which contains NetWare utilities for DOS and Windows workstations.
- Map the second search drive (S2:) to the DOS directory if users access DOS from the network.

- Map the third and subsequent search drives (S3:, S4:, etc.) to directories containing applications.

To avoid inadvertently changing the order of these crucial search drives, map all remaining search drives with the number S16.

This will assign each search drive the next available drive letter, without displacing the previous drives.

If you have an application that requires a particular drive letter, use the following command to map the search drive, replacing *drive:* with the drive letter:

```
MAP S16:=drive:=path
```

If you map a search drive using a number already assigned to a search drive, NetWare makes the old search drive a network drive.

Examples

To map the first search drive to SYS:PUBLIC (which contains NetWare utilities for DOS and Windows workstations) add the following line to the login script:

```
MAP S1:=SYS:PUBLIC
```

Map the second search drive to the DOS directory if users run DOS from the network.

If all users have the same types of computers and use the same version of DOS, you probably only have one DOS directory.

In this case, add a line similar to the following, substituting the correct directory names:

```
MAP S2:=SYS:PUBLIC\IBM_PC\MSDOS\50
```

If your network has more than one DOS directory, use variables to indicate the directory path.

These variables are replaced by the correct information from the workstation software when each user logs in.

To use variables for the DOS directory path, enter the following command in the login script:

```
MAP S2:=SYS:PUBLIC\%MACHINE\%OS\%OS_VERSION
```

To map the next available search drive to the SYS:APPL\WORDPROC directory, add the following line to the login script:

```
MAP S16:=SYS:APPL\WORDPROC
```

To map Richard's first four regular drive mappings to his home directory, SYS:PUBLIC\OS2 (which contains the NetWare utilities for OS/2), REPORTS, and PROJECTS, add the following to Richard's user login script:

```
MAP *1:=VOL1:HOME\RICHARDMAP *2:=SYS:PUBLIC\OS2MAP
  *3:=VOL1:ACCOUNTS\REPORTSMAP *4:=VOL1:UPDATES\PROJECTS
```

To map a drive to the PUBLIC directory on a NetWare v3.12 server named FS1, you need to include the server name in the MAP command. Use the following line in your login script:

```
MAP *5:=FS1\SYS:PUBLIC
```

For more information about drive mappings, see "Drive Mapping" in *Concepts*. For more information about setting paths for OS/2 workstations, see NetWare Workstation for OS/2.

PAUSE

Use PAUSE to pause the execution of the login script.

Command Format

```
PAUSE
```

Using PAUSE

Enter this command in your login script at any point you want a pause to occur.

For example, add PAUSE following a message so the user has time to read the message before it scrolls off the screen.

If you include PAUSE, the message "Strike any key when ready..." appears on the screen. LOGIN then waits for a key to be pressed before it executes the rest of the login script.

PCCOMPATIBLE

Use PCCOMPATIBLE to enable the EXIT login script command to work if your workstation's machine name is not IBM_PC. This command does not apply to OS/2 workstations.

Command Format

```
PCCOMPATIBLE
```

Using PCCOMPATIBLE

If your computer's long machine name in your NET.CFG file is not IBM_PC (for example, HE_PAC, AT&T, or TANDY), and you want to use the EXIT login script command, use PCCOMPATIBLE to inform LOGIN that your machine is an IBM PC compatible.

Place the following anywhere before EXIT in the login script:

```
PCCOMPATIBLE
```

Example

You have a Hewlett Packard computer and you have changed the long machine name to HE_PAC in the NET.CFG file, and you want to exit to NETADMIN from within your login script.

Put the following in your login script:

```
PCCOMPATIBLEEXIT "NETADMIN"
```

For more information about setting the machine name in NET.CFG, see Appendix B in *Workstation for DOS and Windows*. For more information about using the EXIT login script command, "EXIT" on page 162.

REMARK

Use REMARK to insert explanatory text into your login script.

Command Format

```
REM[ARK] [text]or* [text]or; [text]
```

Replace *text* with the comment you want to include in the script.

Using REMARK

To include explanatory text in your login script, begin a line with REMARK, REM, an asterisk (*), or a semicolon (;).

Any text that follows these symbols is ignored when LOGIN executes your login script. Remarks do not appear on your screen.

Using remarks in your login script makes the script easier for you or others to understand.

REMARK and its associated text must be the only entry on a line. Placing remarks on the same line as other script commands can cause errors.

Examples

The following are examples of explanatory text that you might use with the REMARK command:

```
* This is Richard's login script; Mapped network drives
  follow:REM The next mapping is a fake root.REMARK This
  script is for new users.
```

SET

Use SET to set a DOS environment variable to a specified value.

For OS/2 workstations, SET commands affect the environment only while the login script is running; the settings disappear when LOGIN terminates.

Command Format

```
[TEMP] SET name = "value"
```

Replace *name* with an environment parameter that identifies the environment you want to change.

Replace *value* with identifier variable substitutions. Enclose values in quotation marks.

To change the environment for the login script, but not for the workstation itself after the login script has finished executing, use the optional keyword TEMP.

NOTE: Variables set in the login script for an OS/2 workstation apply only to the current session.

Using SET

Use SET in a login scripts the same as you use it at the command line. However, when you use SET in a login script, you must enter quotation marks (" ") around values.

SET commands do not need to be included in login scripts. For example, you may decide that it is easier to put some SET commands in a workstation's AUTOEXEC.BAT file.

For information about values you can set, see the SET command in your DOS or OS/2 documentation.

This command does not work if a DOS workstation's environment is too small. (Set the environment size in the CONFIG.SYS file.)

For more about environment size, see the SHELL command in your DOS manual. (OS/2 workstations do not have this limitation.)

Examples

You can use SET to make your prompt display your current directory path, such as F:\HOME\MARY>, rather than just the drive letter. To do this, add the following line to your script:

```
SET PROMPT = "$P$G"
```

"$P" lists the current directory; "$G" displays a ">" character. For more information, see your DOS manual.

To set a path for a program called DAILY in the REPORTS subdirectory beneath drive G:, add the following line:

```
SET PATH = "G:\REPORTS"
```

This sets the variable PATH to G:\REPORTS.

NOTE: Setting the variable PATH in the login script removes search drives previously assigned. Use SET PATH only before you map search drives.

To display this path, include PATH as an identifier variable in a WRITE command by enclosing the variable (not the value) in angle brackets.

For example, the following line would display "My path is G:\REPORTS."

```
WRITE "My path is" ;<path>
```

To include a DOS environment variable in a MAP command, precede the variable with a percent sign (%).

For example, to set and map a drive to the DOS variable NWS:, include the following lines in a login script:

```
SET NWS = "C:\XYZ"MAP S16:=%<NWS>
```

For more about using the DOS SET command, see your DOS manual.

For more about using DOS environment variables as identifier variables in other login script commands, "Identifier Variables" on page 181.

SHIFT

Use SHIFT to change the order that *%n* identifier variables are interpreted in the login script. SHIFT allows users to enter LOGIN parameters in any order.

Command Format

```
SHIFT [n]
```

Replace *n* with the number of places you want the variable to shift. The default is 1.

Using SHIFT

You can shift up to 10 arguments.

When users execute LOGIN, they can include additional parameters. Each of these parameters is assigned a *%n* variable.

This makes it so that the parameter's real value can then be substituted for the *%n* variable that appears in the login script.

In the login script, you can add the SHIFT command with a positive or negative number to move the variables in either direction. For example, SHIFT -3 moves each *%n* variable three positions to the left.

Example

When Mary logs in, she wants to access her word processing program, change the way it is set up, and map a drive to her work directory called ACCNTS.

Mary also has a command in her login script to map a drive to her LOTUS directory, but she does not need it today.

The commands in Mary's login script are shown below.

```
LOOPIF "%2"="WP" THEN SET WP="\U-CML\B-10\D"MAP
  S16:=SYS:APPS\WP\SETUPIF "%2"="ACCNTS" THEN MAP
  G:=SYS:ACCNTSIF "%2"="LOTUS" THEN MAP
  S16:=SYS:APPS\LOTUSSHIFT 1IF "%2" <> " " THEN GOTO LOOP
```

(In the last line, "IF "%2" <>" is followed by a space enclosed in quotation marks, which means "If %2 isn't blank.")

With these commands in her login script, Mary can log in as follows:

```
LOGIN FS1\MARY WP ACCNTS
```

The parameters in Mary's LOGIN command are given the following values:

%0 = FS1
%1 = MARY
%2 = WP
%3 = ACCNTS

Mary's login script looks for %2, which is WP, and sets the word processing environment.

Then the login script shifts the variables one to the right so that %2 now becomes ACCNTS. Upon executing the loop, the login script maps a drive to the ACCNTS directory.

Mary could also change the order of her LOGIN command without affecting the way her work environment is set up.

```
LOGIN MARY ACCNTS WP
```

The parameters in this LOGIN command are given the following values:

%0 = FS1
%1 = MARY
%2 = ACCNTS
%3 = WP

In this case, Mary's login script looks for %2, which is now ACCNTS. The login script maps a drive to the ACCNTS directory.

Then the login script shifts the variables to the right so that %2 now becomes WP. Upon executing the loop, the login script sets the word-processing environment.

For more about using %*n* variables in login scripts, "Login Script Commands and Variables" on page 155.

WRITE

Use WRITE to display messages when a user logs in.

Command Format

WRITE "[*text*] [%*IDENTIFIER*]" [;] [*identifier*]

Replace *text* with the words you want to display on the screen.

Replace *identifier* with a variable you want to display, such as a user's login name.

Using WRITE

Text you want to display must be enclosed in quotation marks (" ").

There are two ways to display identifier variables in a WRITE command.

You can type the identifier variable preceded by a semicolon (;), or you can enclose an identifier variable inside quotation marks, precede it with a percent sign (%), and type it in uppercase letters.

This is often used when combining regular text with an identifier variable, because both the text and the variable can be enclosed in the same quotation marks.

To join several text strings and identifier variables into a single display without enclosing the variables in quotation marks, use a semicolon between the text and the variables.

If you have several WRITE commands, each one will appear on a separate line on your workstation, unless you put a semicolon at the end of all but the last WRITE commands.

Then the displays appear as one continuous sentence or paragraph (although they may wrap onto additional lines on the screen).

Text strings can also include the following:

Character	Meaning
\r	Carriage return
\n	New line
\"	Embedded quotation mark
\7	Beep sound

In addition to the semicolon, there are additional operators you can use to form compound strings (in other words, to join text and identifier variables into one command).

These operators are listed in the following table, in order of precedence.

Operator	Meaning
;	Join
* / %	Multiply, divide, modules
+ -	Add, subtract
>> <<	Shift left or right (1000 >> 3 becomes 1)

Examples

To display the message "Hello," add the following line to the login script:

```
WRITE "Hello"
```

To display the user's name along with a greeting, add the identifier LOGIN_NAME to the command.

To do this, join the text and the identifier with a semicolon, or include the variable in the quotation marks with the text.

Either of the following lines displays "Hello, Bob" when user Bob logs in:

```
WRITE "Hello, ";LOGIN_NAMEWRITE "Hello, %LOGIN_NAME"
```

For more information about using identifier variables, see the following section, "Identifier Variables."

Identifier Variables

With many login script commands, you can take advantage of identifier variables to make your script more efficient and flexible.

Identifier variables allow you to enter a variable (such as LOGIN_NAME) in a login script command, rather than a specific name (such as RICHARD).

By using the variable, you can make the login script command applicable to many users instead of limiting it to user Richard.

When the login script executes, it substitutes real values for the identifier variables. Therefore, when Richard logs in, the command

```
WRITE "Hello, ";LOGIN_NAME
```

displays the following message on Richard's screen:

```
Hello, Richard
```

Similarly, when Mary logs in, the message she sees is:

```
Hello, Mary
```

In the above example, when the user logged in, the name she used to log in with was substituted for the LOGIN_NAME variable in the command.

Identifier Variable Conventions

When using identifier variables in login script commands, observe the following:

- Identifier variables are used most often with commands such as IF...THEN, MAP, and WRITE. They can also be used with commands for which you can specify a path, such as COMSPEC.
- Type the variable exactly as shown.
- To use DOS environment variables as identifiers, enclose them in angle brackets.
- Identifier variables can be placed within literal text strings in a WRITE statement.

  However, the identifier variable must be in uppercase letters and preceded by a percent (%) sign. (Literal text is text that is displayed on screen, such as "Sales report is due today." Enclose literal text in quotation marks.)

Examples

If Mary logs in during the morning, both of the following lines would display the same message on her screen ("Good morning, Mary"):

```
WRITE "Good ";GREETING_TIME"," ;LOGIN_NAME
WRITE "Good %GREETING_TIME, %LOGIN_NAME"
```

To use DOS environment variables as identifiers, enclose them in angle brackets. The following example uses the DOS environment variable "path."

```
WRITE "my path is " ;<path>
```

The text displayed would be similar to

```
my path is z:.;y:.;c:\WINDOWS
```

NOTE: Setting the variable PATH in the login script removes search drives previously assigned. Use SET PATH only before you map search drives. For more information about SET, "SET" on page 175.

"Identifier Variables" on page 182 lists identifier variables.

Table 13 Identifier Variables

Category	Identifier Variable	Function
Date	DAY	Day number (01 through 31).
	DAY_OF_WEEK	Day of week (Monday, Tuesday, etc.).
	MONTH	Month number (01 through 12).
	MONTH_NAME	Month name (January, February, etc.).
	NDAY_OF_WEEK	Weekday number (1 through 7, with 1=Sunday).
	SHORT_YEAR	Last two digits of year (90, 91, 92, etc.).
	YEAR	All four digits of year (1990, 1991, 1992, etc.).
Time	AM_PM	Day or night (am or pm).
	GREETING_TIME	Time of day (morning, afternoon, or evening).
	HOUR	Hour (12-hour scale; 1 through 12).
	HOUR24	Hour (24-hour scale; 00 through 23, 00=midnight).
	MINUTE	Minute (00 through 59).
	SECOND	Second (00 through 59).

Category	Identifier Variable	Function
User	FULL_NAME	User's full name.
	LOGIN_NAME	User's unique login name.
	MEMBER OF "*group*"	Group that the user is assigned to.
	NOT MEMBER OF "*group*"	Group that the user is not assigned to.
	PASSWORD_EXPIRES	Number of days before password expires.
	USER_ID	Number assigned to each user for mail directories, etc.
Network	FILE_SERVER	NetWare server name.
	NETWORK_ADDRESS	Network number of the cabling system (8-digit hexadecimal number).
Workstation	DOS_REQUESTER	Version of the workstation's DOS shell (1.02, etc.) Supports v2.x and v3.x shells.
	MACHINE	Type of computer (IBM_PC, etc.). See your DOS manual for more information. (*non-OS/2*)
	NETWARE_REQUESTER	Version of the NetWare Requester for OS/2 (2.00, etc.).
	OS	Type of DOS on the workstation (MSDOS, DR DOS).
	OS_VERSION	Version of DOS on the workstation (3.30, 6.0, etc.).
	P_STATION	Workstation's node address (12-digit hex).
	SHELL_TYPE	Version of the workstation's DOS shell (1.02, etc.) Supports v2.x and v3.x shells.
	SMACHINE	Short machine name (IBM, etc.) (*non-OS/2*).
	STATION	Workstation's connection number.
DOS Environment	<*variable*>	Any DOS environment variable can be used in angle brackets (<*path*>, etc.).
		To use a DOS environment variable in a MAP command, add a percent sign (%) in front of the variable, such as MAP S16:=%<*path*>.

Category	Identifier Variable	Function
Miscellaneous	ACCESS_SERVER	Shows whether the access server is functional (TRUE=functional, FALSE=not functional).
	ERROR_LEVEL	An error number (0=No errors).
	%*n*	Replaced by parameters the user enters at the command line with the LOGIN utility.

Using LOGIN Parameters with %*n* Variables

Some variables in a login script can be indicated by a percent sign (%) followed by a number from 0 to 9.

When users log in, they can type additional parameters that the LOGIN utility passes to their login script. The login script then substitutes these parameters for any %*n* variables in the script.

These variables are replaced in order, by the parameters the users type when they execute LOGIN.

%0 is always replaced by the name of the first NetWare server the user connected to, and %1 always indicates the user's login name.

The remaining variables change, depending on what the user typed when he or she executed LOGIN.

The SHIFT login script command allows you to change the order in which these %*n* variables are substituted ("SHIFT" on page 177).

Example

A login script contains the following commands:

```
IF "%2" = "SALES" THENWRITE "Meeting today"ENDIF "%3" =
  "LEGAL" THENWRITE "Report is due tomorrow"END
```

If user RON logged in by typing

```
LOGIN COUNT\RON SALES MARKETING
```

then the login script would substitute the values Ron entered at the keyboard for the %*n* variables in the script, as shown below:

%0 = COUNT

%1 = RON

%2 = SALES
%3 = MARKETING

Since %2 is replaced by "SALES," the message "Meeting today" is displayed on Ron's screen.

However, since %3 is replaced by "Marketing," Ron will not see the message "Report is due tomorrow."

Examples of Login Scripts

The following examples of login scripts may help you plan your own system and user login scripts.

Each example script is shown in a table. The left column of the table shows the commands in the script. The right column explains the command.

Default Login Script

The default login script executes every time SUPERVISOR logs in until a personal script is created for the supervisor. It also executes for users who do not have user login scripts.

You cannot modify the default script. Instead, create system or user scripts.

Table 14 Default login script

Login script commands	Purpose
MAP DISPLAY OFF	Prevents map commands from displaying on the screen.
MAP ERRORS OFF	Prevents mapping errors from displaying on the screen.
Rem: Set 1st drive to most appropriate directory.	Remark; explains the following commands.
MAP *1:=SYS:	Maps the first drive to volume SYS:.
MAP *1:=SYS:%LOGIN_NAME	Maps the first drive to the user's home directory. If the user has no home directory, the first drive is still mapped to SYS:.

Login script commands	Purpose
IF "%1"="SUPERVISOR" THEN MAP *1:=SYS:SYSTEM	If the login name is SUPERVISOR, it maps the first drive to SYS:SYSTEM instead of to the user's home directory.
Rem: Set search drives.	Remark; explains the following commands.
MAP S1:=SYS:PUBLIC	The first search drive is mapped to SYS:PUBLIC, where DOS-based NetWare utilities are stored.
MAP S2:=S1:%MACHINE\%OS\%OS_VERSION	The second search drive is mapped to the directory where DOS is stored.
Rem: Now display current drive settings.	Remark; explains the following commands.
MAP DISPLAY ON	Allows map commands to display.
MAP	Displays a list of all drive mappings on the user's screen.

Use the default login script temporarily. The default login script is contained in the LOGIN.EXE file in SYS:LOGIN and cannot be edited.

Create a system login script *before* you edit user login scripts. Include as much as possible in the system login script. The more the system login script accomplishes, the shorter user login scripts can be.

If you want to execute a system login script and do not want user login scripts to execute,

- Place the EXIT command at the end of the system login script. This causes login script processing to end before checking for the user login script. No user login scripts can execute.
- Use the script option of the LOGIN command.

  This option executes a file containing valid commands. It will not use the system, user, or default login scripts.

  Since the login script attaches before executing the script option, the file can be located on the network. The following command will execute only the system login script:

  ```
  LOGIN /S SYS:PUBLIC\NET$LOG.DAT
  ```

  For OS/2, use:

```
LOGIN /S server name\SYS:PUBLIC\NET$LOG.DAT
```

Other users could remove the /s option and have their own login scripts.

System Login Script

The system login script should contain as much information as possible that applies to all users.

Table 15 Sample system login script

Login script commands	Purpose
MAP DISPLAY OFF	Prevents map commands from displaying on the screen as they are assigned.
MAP ERRORS OFF	Prevents mapping errors from displaying on the screen.
MAP *1:=SYS:	Maps the first drive to volume SYS:.
MAP *1:=SYS:%LOGIN_NAME	Maps the first drive to the user's home directory. If the user has no home directory, the first drive is still mapped to SYS:.
IF "%1"="SUPERVISOR" THEN MAP *1:=SYS:SYSTEM	If the login name is SUPERVISOR, it maps the first drive to SYS:SYSTEM instead of to the user's home directory.
IF OS = OS/2 THEN MAP *2:=SYS:PUBLIC\OS2 ELSE	If the user logs in from an OS/2 workstation, the second network drive is mapped to the directory where NetWare utilities for OS/2 are stored.
MAP S1:=SYS:PUBLIC MAP S2:=SYS:PUBLIC\%MACHINE\%OS\%OS_VERSION	If the user is not using an OS/2 workstation, the first search drive is mapped to SYS:PUBLIC, where DOS-based NetWare utilities are stored.
END	The second search drive is mapped to the directory where DOS is stored. For example, If all workstations use DOS, use the following two commands instead of the IF...THEN command: MAP INS S1:=SYS:PUBLIC MAP INS S2:=SYS:PUBLIC\%MACHINE\%OS\%OS_VERSION

Login script commands	Purpose
MAP S16:=VOL1:APPL\WP	Maps the next available search drive to the directory that contains WordPerfect.
MAP S16:=VOL1:APPL\LOTUS	Maps the next available search drive to the directory that contains Lotus.
MAP S16:=SYS:EMAIL	Maps the next available search drive to the E-mail directory.
IF MEMBER OF "MANAGERS" THEN MAP *3:=VOL1:PROJECTS\REPORTS	If the user belongs to the MANAGERS group object, the script maps the third network drive to the REPORTS directory.
IF MEMBER OF "TESTERS" THEN MAP *3:=INPUT:STATUS\UPDATES	If the user belongs to the TESTERS group object, the script maps the third network drive to the UPDATES directory.
COMSPEC = S2:COMMAND.COM	Sets COMSPEC to the DOS command processor, located in the DOS directory (in the second search drive).
SET PROMPT = "PG"	Sets the prompt to display the user's current directory path, followed by the > symbol.
MAP DISPLAY ON	Allows map commands to display.
MAP	Displays a list of all drive mappings.
WRITE	Displays a blank line between the list of mappings and following lines.
WRITE "Good %GREETING_TIME, %LOGIN_NAME."	Displays a greeting to the user. Example: "Good morning, MARY."
WRITE "Your password expires in %PASSWORD_EXPIRES days."	Displays a message indicating the number of days before the user's password expires.
FIRE PHASERS 3 TIMES	Makes the phaser sound occur three times.

User Login Script

The following is an example of a user login script for Mary. (The user login script executes after the system login script.)

Table 16 Sample user login script

Login script commands	Purpose
MAP DISPLAY OFF	Prevents map commands from displaying on the screen as they are assigned.
MAP ERRORS OFF	Prevents mapping errors from displaying on the screen.
MAP *4:=VOL1:MARY\PROJECTS\RESEARCH	Maps Mary's fourth network drive (after those assigned in system scripts) to the RESEARCH subdirectory in her home directory.
MAP *5:=VOL1:FORMS	Maps Mary's fifth network drive (after those assigned in system scripts) to the FORMS directory.
REM Mary needs access to FORMS while she's on the REM troubleshooting team. Remove this mapping REM when she's reassigned.	This is a reminder to the person who created the login script. This remark will not display on the user's screen. (Because the remark is several lines long, each line starts with the keyword REM.)
SET WP="/u-mjr/b-5"	Sets Mary's environment variables for WordPerfect.
SET EMAIL USER="mrichards"	Sets Mary's user name (mrichards) for E-mail.
#CAPTURE Q=FAST_Q NB TI=10 NFF	Executes the CAPTURE utility so Mary can print from non-network applications.
PCCOMPATIBLE EXIT "NMENU TRAINING"	Stops the user login script and sends the user into a menu program called TRAINING. (DOS workstations with the machine name IBM_PC and OS/2 workstations do not need the PCCOMPATIBLE line.)

Where to Go from Here

To	See
Optimize your server's performance	“Optimizing Network Performance” on page 289
Install a print server	Print Server
Set up workstations to do file server commands	"Remote Management" in *System Administration.*

7 Upgrade an Existing File Server

Upgrade Overview

Upgrade an existing NetWare v2.1x or v3.x file server to v3.12 using either the NetWare Migration Utility, or the NetWare In-Place Upgrade NLM.

The NetWare Migration utility, a workstation-based utility, allows you to transfer your network information from a NetWare v2.x or v3.x server to an existing v3.12 server that is on the same network.

The In-Place Upgrade NLM, a server-based utility, allows you to change your network server that is running NetWare v2.1x or higher into a NetWare v3.12 server without purchasing additional hardware.

Upgrade an IBM LAN Server v1.3 and PCLP v1.3 to a NetWare v3.12 file server using the NetWare Migration utility.

Steps for upgrading a NetWare v2.1x or v3.x server are:

1. Choose the Migration or In-Place Upgrade option by reading "Choose Migration or In-Place Upgrade" on page 193
2. Upgrade your server by following the procedures in either "Upgrade Using Migration" on page 213, or "Upgrade Using In-Place Upgrade" on page 249.
3. Prepare and install workstation equipment. See the following
4. Workstation Basics and Installation.
5. NetWare Workstation for DOS and Windows.

6. NetWare Workstation for OS/2.
7. (Optional) Bring your servers up to peak performance by reading "Optimizing Network Performance" on page 289.
8. Set up your network printing environment by reading Print Server.

8 Choose Migration or In-Place Upgrade

Options for Upgrading Your Existing File Server

To upgrade an existing NetWare v2.1x or v3.x server, use either the NetWare Migration utility or the NetWare In-Place Upgrade NLM. This section provides you with information to help you decide which utility is best for you.

"NetWare Upgrade Options" on page 194 gives you a brief explanation of upgrade options and the advantages of one option over another.

The NetWare Migration utility may be used using one of two methods: "Across-the-Wire Migration" and "Same-Server Migration." "NetWare Upgrade Options" on page 194 lists both methods.

For a complete discussion of the NetWare Migration utility, see "What a Migration Does" on page 195.

For a complete discussion of the NetWare In-Place Upgrade NLM, see "What an In-Place Upgrade Does" on page 209.

Table 17 NetWare Upgrade Options

Upgrade	Options Available	Advantages	Disadvantages
NetWare v2.x to v3.12	Across-the-Wire to an installed v3.12 server ("Across-the-Wire Migration" on page 195).	No risk of data loss. Can migrate many servers to one server. Can choose what data you want to migrate. Can direct data to specific volume or directory.	Need a v3.12 server installed.
	Same-Server migration ("Same-Server Migration" on page 197).	Can choose what data you want to migrate.	Some risk of data loss. Need a workstation (or tape backup) with enough disk space for data files.
	In-Place Upgrade from v2.1x or v2.2 to v3.12 "Upgrade Using In-Place Upgrade" on page 249).	Just need one v2.1x server	Cannot upgrade from v2.0a. Need an 80386 or higher processor. If upgrade fails, you may have to restore your v2.1x data from backup.
NetWare v3.x to v3.12	Across-the-Wire migration to an installed v3.12 server ("Across-the-Wire Migration" on page 195).	No risk of data loss. Can migrate many servers to one server. Can choose what data you want to migrate. Can direct data to specific volume or directory.	Need a v3.12 server installed.
	Same-Server migration ("Same-Server Migration" on page 197).	Can choose what data you want to migrate.	Some risk of data loss. Need a workstation (or tape backup) with enough disk space for data files.

NetWare v3.x to v3.12	In-Place Upgrade from v3.x to v3.12 ("Upgrade Using In-Place Upgrade" on page 249).	Just need one v3.x server—no additional hardware needed.	Cannot upgrade from v3.0. If upgrade fails, may have to restore original data from backup.
LAN Server or PCLP to NetWare v3.12	Across-the-wire migration procedures ("Across-the-Wire Migration" on page 195).	No risk of data loss.	Additional hardware needed.
LAN Server or PCLP to NetWare v3.12	Same Server migration procedures ("Same-Server Migration" on page 197).	No additional hardware needed.	Some risk of data loss. Need a workstation (or tape backup) with enough disk space for data files.

What a Migration Does

The Migration utility converts servers from NetWare v2.1x or 3.x, or from another operating system, to NetWare v3.12 using either of two methods:

- *Across-the-Wire*, where you move network information from a NetWare v2.x or v3.x server to a v3.12 server that is on the same network (see "Across-the-Wire Migration" on page 195 for procedures).
- *Same-Server*, where you change your NetWare v2.x or v3.x server to a v3.12 server (see "Same-Server Migration" on page 197 for procedures).

  NOTE: All references to NetWare v2.1x throughout this manual include NetWare v2.2.

Across-the-Wire Migration

In across-the-wire migration, files are migrated from a source server across the network to the destination server.

Selected bindery information is migrated to a working directory on the local hard drive, translated to NetWare v3.12 format, and then migrated to the destination server.

For information on binderies, see "Bindery" in *Concepts*.

Across-the-wire migration allows you to preserve your user environment (users and their trustee assignments), as well as default account restrictions, accounting methods, print queues, and print servers.

These entities are all contained in the bindery. A bindery is a database that contains definitions for entities such as users, groups, workgroups, NetWare servers, and print servers.

When you use across-the-wire migration, you can choose either the standard or the custom migration option.

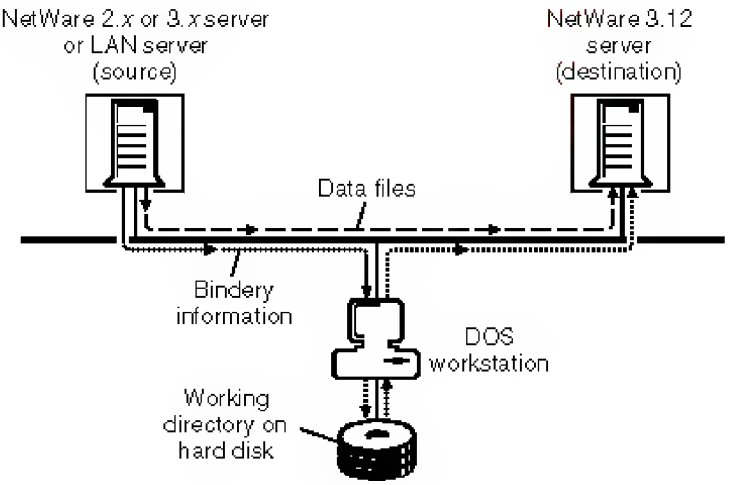
- The standard option provides the easiest path for a simple migration: it migrates all information from the NetWare v2.x or v3.x server across the network to a NetWare v3.12 server.

  You can migrate multiple servers with this option, one at a time.

- The custom option lets you select specific information from the bindery and data files so that you can upgrade a server or several servers (one at a time) and create a customized destination server.

"Across-the-wire Migration" on page 196 illustrates the across-the-wire method.

Figure 66 Across-the-wire Migration



Same-Server Migration

A same-server migration updates a server that will be installed on the same hardware as the old source server, allowing you to change your NetWare v2.x or v3.x server into a v3.12 server.

Unlike across-the-wire migration which utilizes two computers, same-server migration involves only one. There is, however, some risk to the data during the migration process.

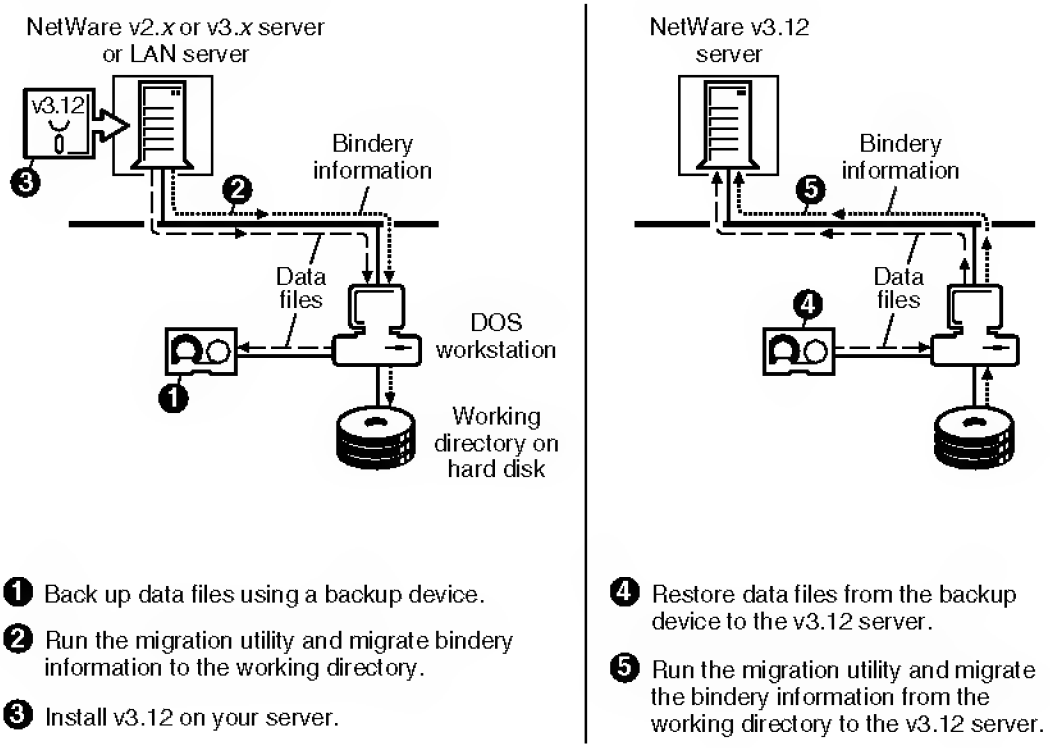
Also, you may not be able to migrate file attributes (because the same-server method does not migrate data files).

When you use the same-server method, you can use only the custom option because you cannot migrate data files.

You must back up your data files and then restore them to the NetWare v3.12 server after it is installed.

"Same-Server Migration" on page 198 illustrates the same-server method.

Figure 67 Same-Server Migration



1. Back up data files using a backup device.
2. Run the migration utility and migrate bindery information to the working directory.
3. Install v3.12 on your server.
4. Restore data files from the backup device to the v3.12 server.
5. Run the migration utility and migrate the bindery information from the working directory to the v3.12 server.

See the following chart for specific page references for across-the-wire and same-server procedures.

If you choose	See
Across-the-Wire	"Across-the-Wire Migration" on page 195.
Same-Server	"Same-Server Migration" on page 197.

How Data Is Migrated Across the Wire

Migrating Files

- The migration utility leaves the source server intact and only copies information to the destination v3.12 server.
- NetWare v2.x or v3.x system files are not migrated.
- Any file on a source server that has the same name as one that exists on the destination server is not copied to the destination server.

  An error message appears on the screen during the migration, and is also written to the migration report, to let you know that a file by that name already exists on the destination server.

  If the file already exists, rename the file and copy it to the destination server after migration.
- The system login script is not migrated, but user login scripts are.

  Examine each user login script after migration and make corrections if the server name or path names have changed.

Migrating Directories

- If a directory is being migrated that has the same name and path as a directory that already exists on the NetWare v3.12 server, the files from both directories are merged under the destination directory name.
- The directory structure and files are migrated and become a part of the v3.12 file system. If necessary, modify the organization on the destination server after all source servers are migrated.

Migrating Users

Users on the source server are created as new users on the destination server.

Account restrictions and user designations for existing users are copied.

Users with the same username are merged; that is, their user designations are added together.

Custom Migration

The custom option lets you select specific information from the bindery and data files so you can upgrade a server or several servers (one at a time) and create a customized destination server.

"Information that can be migrated using the custom migration option" on page 200 shows the information you can migrate using the custom migration option.

Table 18 Information that can be migrated using the custom migration option

Category to be migrated	Description
All Information	Migrates all information listed in this table.
Data Files	Migrates all data files and their DOS and NetWare attributes for files and directories to the corresponding v3.12 attributes. For details on what the corresponding attributes are, see "Migrating File Attributes" on page 204.
Trustee Assignments	Migrates rights assigned to users and groups for directories and files to corresponding v3.12 rights. If you select this category, you must also select "Users," "Groups," and "Data Files" if the users and data files do not already exist on the destination server. If you migrate "Trustee Assignments" and the corresponding users and groups do not exist on the destination server, or the directories do not exist, a series of error messages appears. For details on what the corresponding rights are, see "Migrating Directory Attributes" on page 207.
Users	Migrates the following, unless they already exist on the destination server: ◆ Users ◆ User print job configurations (PRINTCON.DAT) ◆ User login scripts for both DOS and OS/2 (LOGIN.BAK is not migrated)

Category to be migrated	Description
User Restrictions	Migrates account restrictions, station restrictions (not migrated from LAN Server), and time restrictions. If a user exists on the destination server, his or her restrictions are not overwritten. If you select this category, you must also select "Users." If a user with a corresponding set of restrictions doesn't exist on the destination server, then the restrictions set on the source server are migrated to the destination server and are not overwritten or merged by any subsequently migrated source servers. Volume and disk restrictions for users do not get migrated because of differences in NetWare v2.x and v3.12. In v2.x, the restrictions were server-wide, whereas in v3.12 the restrictions are volume-specific.
Groups	Migrates the Group's members and assigned group trustee rights for directories and files. Groups that existed on the source server remain intact. If multiple source servers are migrated, then groups from the servers are merged on the destination server.
Default Account Restrictions	Migrates default account restrictions. Default account restrictions on the destination server are overwritten by any source server that also has default account restrictions. The set of default restrictions includes Account balance and low limit Account expiration date Concurrent connections limit Grace logins Home directory for users Intruder detection Password minimum length Periodic password interval Time restrictions
Accounting Information	Migrates the accounting charge method chosen to charge for services (blocks read, blocks written, connect time, disk storage, service requests). Migrates account servers. Charge rates that exist on the source server are left intact.
Print Queues and Print Servers	LAN Server only migrates print queues. NetWare migrates the following: Print queues Print queue operators and users Print queue servers Print queue status Print servers Print server operators and users Print server control files

NOTE: "LAN Server components that are not migrated" on page 202 describes LAN Server components that do not get migrated.

Table 19 LAN Server components that are not migrated

LAN Server component	Explanation	NetWare equivalent
ALERTER	Notifies the administrator of defined events.	None, but NetWare keeps track of many of these events.
AT	Gives Execute command at a set time.	None.
AUTO LOG OFF	Shuts the system down after extended inactivity.	None.
External resources	These don't apply to NetWare.	None.
MACHINE ID	Unique workstation name.	Use network board ID.
NETRUN	Allows you to run programs at the server.	None.
REPLICATOR	Periodically duplicates selected files.	None.
RIPL	Remote Initial Program Load.	Remote Reset or Remote Boot: The Remote Boot image file must be set up on the NetWare server.
Station restrictions	Defines which machine ID can be used by a username to log in to the LAN Server domain.	Station Restrictions: Must be set up using NetWare and LAN card ID.

How Rights and Attributes are Migrated

In NetWare v2.x, rights are assigned only at the directory level. In NetWare v3.12, rights are assigned at the file and directory levels.

When you use the across-the-wire migration, all NetWare v2.x rights and attributes are translated into the v3.12 format. The Maximum Rights Mask is replaced with an Inherited Rights Mask, which allows rights to flow down the directory structure.

The tables beginning "Evolution of directory and file rights" on page 203 list the corresponding NetWare v3.12 rights and attributes. There is no change in directory and file rights in any v3.x version.

Migrating Directory and File Rights

In NetWare v3.12, rights are granted for a specific directory or file by trustee assignments. A user with a trustee assignment to a directory or file is a trustee of that directory or file.

NOTE: If you are migrating from LAN Server, LAN Server permissions (rights) do not flow down, but are limited to the directory where they are set. After the migration to NetWare v3.12, rights do flow down the directory structure.

"Evolution of directory and file rights" on page 203 shows the directory and file rights for NetWare versions 2.1x, 2.2, 3.11, and 3.12. There is no change in directory and file rights from NetWare v3.1x to v3.12.

Table 20 Evolution of directory and file rights

Right	Description	Changes in v3.12
Supervisory (v3.11)	Grants all rights to the directory, its files, and its subdirectories.	Name change to Supervisor.
Create (all versions) [directories, files]	Assigned only if Open is also assigned.	Creates subdirectories without Access Control (was Parental).
Delete (v2.1x) [directories, files] Erase (v2.2, v3.11)	Deletes directories and files.	Name change to Erase.
Modify (v2.1x) [files] Modify (v2.2, v3.11) [directories, files]	Renames directories or files or changes their attributes.	No longer requires Access Control to rename directories, files, or attributes.
Open (v2.1x) [directories, files]	Opens files and directories.	Assigned automatically with Read, Write, and Create.
Read and Open (v2.1x) [files only] Read (v2.2, v3.11)	Reads and scans files and directories.	A separate Open right is no longer required.
Parental (v2.1x) [directories, files] Access Control (v2.2, v3.11)	The trustee assignments and Inherited Rights Filters control how other objects can access the object.	Rights assigned with Access Control can be revoked at the subdirectory and file level. No longer assigns the right to create or rename subdirectories.

Right	Description	Changes in v3.12
Search (v2.1x) [directories, files]	Searches/scans files and directories.	Includes the right to search to the root of a directory.
File Scan (v2.2, v3.11) [directories, files]		Assigned automatically when any rights are assigned.
Write and Open (v2.1x) [files only]	Allows the user to write to files or directories.	Open right is no longer required; Write is sufficient.
Write (v2.2, v3.11) [directories, files]		

Migrating File Attributes

NetWare v3.12 reads attributes that you set (for example, to compress or back up a file) or sets attributes to tell you what has been done (for example, that a file is compressed or migrated).

"Evolution of file attributes" on page 204 shows file attributes for NetWare versions 2.1x to 2.2, v3.11, and v3.12.

For additional information, see "Attributes" and "Security" in *Concepts*.

Table 21 Evolution of file attributes

Attribute	Description	Changes in v3.12
Copy Inhibit (v3.11)	Prevents Macintosh users from copying a file. Overrides Read and File Scan rights. Modify right required to remove this attribute.	No change.
Delete Inhibit (v3.11)	Prevents users from erasing files. Overrides Erase right. Modify right required to remove this attribute.	No change.

Attribute	Description	Changes in v3.12
Execute Only (v2.1x to v2.2, v3.11)	Prevents copying or backing up files. *This attribute cannot be removed.* Assign only to files with an .EXE or .COM extension (program files). Keep a duplicate of these files in case they become corrupted and need to be replaced. *CAUTION:* Some programs will not execute properly if flagged Execute Only.	No change.
Hidden (v2.1x to v2.2, v3.11)	Hides files from DOS DIR scans and prevents them from being deleted or copied. Files will appear in NetWare NDIR scan if user has the File Scan right.	No change.
Indexed (v2.1x to v2.2, v3.11)	Allows large files to be accessed quickly. Automatically assigned to files with over 64 regular FAT entries. Can be set, but has no effect.	No change.
Modified Since Last Backup (v2.1x) Archive Needed (v2.2, v3.11) [name change only]	Identifies files modified after last backup. Assigned automatically.	Archive needed [same as v3.11].
Purge (v3.11, v3.12)	Purges a file as soon as it is deleted if the file is flagged with this attribute or resides in a directory flagged with this attribute. *CAUTION:* Purged files cannot be recovered with SALVAGE.	No change.

Attribute	Description	Changes in v3.12
Read Only (All versions)	Indicates whether a file can be modified. All files are automatically flagged Read Write when they are created and can be modified unless the Read Only attribute is set. Assigning Ro automatically activates Delete Inhibit and Rename Inhibit. Modify right required to remove the Ro attribute.	No change.
Read Write (All versions)		Set automatically when the Read Only attribute is not set.
Rename Inhibit (v3.11, v3.12)	Prevents users from renaming files. Modify right required to remove this attribute.	No change.
Shareable (All versions)	Allows several users to access a file simultaneously. Usually used in combination with the Read Only attribute.	No change.
Non-Shareable (All versions)	Restricts multiple-user access to files.	No character is displayed to indicate the file is non-shareable.
System (All versions)	Assign to system files. Hides these files from DOS DIR scans and prevents them from being deleted or copied. Files will appear in NetWare NDIR scans if a user has the File Scan right.	No change.
Transactional (All versions)	Activates the Transaction Tracking System (TTS). Prevents data corruption by ensuring that all changes are made to files being modified or that none are. Especially helpful for database files.	No change.

Migrating Directory Attributes

No directory attributes were available in NetWare versions 2.0a, 2.1, 2.11, or 2.12. If you are migrating from any of these versions, set the directory attributes manually after the migration is complete.

"Evolution of directory attributes" on page 207 shows directory attributes for NetWare versions 2.1x, 2.2, 3.11, and v3.12. For additional information, see "Attributes" and "Security" in Concepts.

Table 22 Evolution of directory attributes

Attribute	Description	Changes in v3.12
Delete Inhibit (v3.11)	Prevents users from erasing directories. Overrides Erase right. Modify right required to remove this attribute.	No change
Hidden (v2.1x to v2.2, v3.11)	Hides directories from DOS DIR scans and prevents them from being deleted or copied. Directories appear in NetWare NDIR scan if user has the File Scan right.	No change
Normal (v2.2)	Indicates no attributes have been set.	Not available
Private (v2.1x to v2.2)	Allows users to see the directory but not its subdirectories. You need to change the trustee assignments (rights, not attributes) for users that have access to directories flagged Private. Grant these users only the Create right to the directory.	Not available
Purge (v3.11)	Purges a file as soon as it is deleted if the file is flagged with this attribute or resides in a directory flagged with this attribute. *CAUTION:* Purged files cannot be recovered with SALVAGE.	No change
Rename Inhibit (v3.11)	Prevents users from renaming directories. Modify right required to remove this attribute.	No change

Attribute	Description	Changes in v3.12
System (All versions)	Assign to system directories. Hides these directories from DOS DIR scans and prevents them from being deleted or copied. Directories appear in NetWare NDIR scans if a user has the File Scan right.	No change

Password Migration

Passwords are not migrated. The migration utility allows you to either

- Assign passwords that are generated randomly for all migrated users.
- Allow users to log in to the new system without a password.

Passwords generated randomly are stored in a file called NEW.PWD in SYS:SYSTEM on the NetWare v3.12 destination server and can only be accessed by the user SUPERVISOR.

Strategies for Merging Source Servers

Choose one of several strategies to help you minimize the amount of time you spend customizing your v3.12 server after you migrate several servers to it.

"Information that can be migrated using the custom migration option" on page 200 shows the types and descriptions of information you can choose to migrate from a source server.

Read through these categories and their descriptions; then see "Setting Up Your Destination Server" on page 209.

Setting Up Your Destination Server

To	Then
Set up default account restrictions on the destination server.	Set up the Default Account Balance/Restrictions on the first source server and include that category in the information to be migrated. On subsequent source servers that you migrate to the same destination server, do not migrate that category.
Set up uniform user restrictions on the destination server.	On the first source server, set up the Default Account Balances/Restrictions with the values you want on the destination server. Choose "Users" and "Default Account Balances/Restrictions" as categories to migrate, but do not choose "User Restrictions." On subsequent source servers, do not choose "User Restrictions" or "Default Account Balances/Restrictions."
Preserve each user's individual user restrictions.	Choose "User Restrictions" for each source server.
Merge users and groups from several source servers.	Choose "Groups" and "Users" on all source servers. The corresponding users on the destination server are added to the appropriate groups.
Set up print queues and print servers.	Choose "Print Queues" and "Print Servers" on source servers. In NetWare v3.12, multiple printers can be serviced by each queue and multiple queues can service the same printer.

What an In-Place Upgrade Does

An in-place upgrade allows you to upgrade a NetWare 2.1x server to v3.12 using SERVER.EXE with the 2XUPGRDE.NLM.

Upgrading a NetWare v2.1x or v2.2 *server* includes two parts:

1. The file system is upgraded.
2. The new operating system is installed.

Upgrading a NetWare v2.1x *file system* has four phases:

1. The file system is analyzed/inventoried.

2. The disks are analyzed.
3. The disks are modified.
4. A NetWare v3.12 bindery is created to replace the v2.1x bindery.

"Phases in the Upgrade" on page 210 illustrates the four phases.

Figure 68 Phases in the Upgrade

HINT: For experienced installers, a complete set of instructions for the upgrade starts with "Boot NetWare v3.12" on page 251.

Following is a discussion of what happens during each phase of the upgrade. When you run the upgrade, status messages will refer to each of the actions discussed here.

Phase 1: Analyzing the NetWare v2.1x File System

- Each disk is inventoried.
- The system displays what volumes are on each disk.
- This phase approximates the memory needed to successfully complete an upgrade.

Phase 2: Analyzing the NetWare v2.1x Disk

- The locations of the Hot Fix area, the system and volume areas, the Directory Entry Tables (DETs) and the File Allocation Tables (FATs) are determined. A layout of the disk for v3.12 is created from this information.
- A list of disk blocks that must be moved is created.
- For example, if a block on VOL1: is on the disk in a location that is now assigned to VOL0:, it must be moved to a location that was assigned to VOL1: when the disk layout for v3.12 was created.
- The DETs and FATs for each volume are translated.

- Directory and file attributes are upgraded automatically.

  Macintosh folders and files are also upgraded if you are running NetWare for Macintosh. The Macintosh name space module should also be loaded (MAC.NAM).

- This phase ensures the system has enough memory and free disk space to complete the upgrade.

  If the v2.1x disks do not have enough space for the upgrade to occur, a warning appears and the upgrade stops. (You must create more room on the disk, and then restart the upgrade.)

Phase 3: Modifying Each NetWare v2.1x Disk

- The partition table on track 0 is updated and the v3.12 system tables are written to the system area. The DETs and FATs for each of the v3.12 volumes are duplicated.
- Blocks are moved to their new locations on the disk. The v2.1x system is not functional after this phase begins.

  If a power failure or similar event occurs during this phase, you must restore your v2.1x system from your backup.

Phase 4: Upgrading the NetWare v2.1x Bindery to v3.12

- Most v2.1x bindery information is upgraded to v3.12. Other information that is upgraded includes account restrictions and print queues.
- NetWare v2.1x passwords are not retained in the v3.12 bindery. If you chose to assign new passwords to users, those are created and put into a file called NEW.PWD (in the SYS: SYSTEM directory).
- VAPs do not get upgraded. They are unique to NetWare v2.x and do not exist in NetWare v3.x.

  Third-party VAP functionality is lost during this upgrade. After you upgrade to v3.12, delete VAP files.

- Core printing services are not upgraded. After you finish upgrading to v3.12, delete print services and re-create them.
- Volume and disk restrictions for users are not upgraded because of differences between the v2.1x and v3.x file systems.

  In v2.1x the restrictions were server-wide, whereas in v3.x the restrictions are only per volume.

9 Upgrade Using Migration

Overview

The NetWare Migration Utility allows you to upgrade your file servers from NetWare v2.1x, v3.x, or another network operating system to v3.12 using two methods:

- Across-the-wire, where you move your network information from a NetWare v2.1x or v3.x server to a v3.12 server that is on the same network ("Across-the-Wire Migration" on page 217 for procedures).
- Same-server, where you change your NetWare v2.x or v3.x server to a v3.12 server ("Using the Same-Server Migration Method" on page 237 for procedures).

  "Necessary Resources" and "Prerequisites" for the same-server method begin on page 247.

Necessary Resources

- A working copy of the NetWare diskettes ("Make Working Copies of the NetWare Diskettes" on page 27).
- (If migrating from CD ROM) a CD ROM reader.
- The NetWare Migration Utility files located on the *Migration* diskette.
- A DOS workstation with at least 640 KB of memory and 5 MB of free disk space on either a hard drive or another network drive.

  Be sure the following line is in the CONFIG.SYS file: files=20. Be sure the following line is in the NET.CFG file: ipx retry count=60.
- NetWare v3.12 installed on a server with a 386 or higher processor.

- A network with a DOS workstation (using NETx.COM v3.02 or later), a NetWare v2.x or v3.x source server (or LAN Server or PCLP), and a v3.12 destination server attached.
- A backup device for data storage.

Prerequisites

- *For across-the-wire migration, set up the NetWare v3.12 destination server.*

  Create the volumes you want to migrate data to. For specific instructions on creating volumes, see "Create Volume SYS:" on page 59. You cannot create volumes from the migration utility.

  You may want to create a directory to migrate the NetWare v2.x or v3.x SYS: volume to so that you can remove unnecessary v2.x or v3.x files more easily.

  NOTE: Since two servers on the same network cannot share the same name, the destination server must have a unique name.

  NOTE: If you are migrating from LAN Server, add "/API /NMS:2 /NVS:2" to the DOSLAN.INI file. For the order of parameters, see your LAN Server documentation.

- *Make sure that all users (this includes print servers), except SUPERVISOR, are logged out of the source and destination servers and that all files (except bindery files) are closed during migration.*

  NOTE: If you are migrating from LAN Server, you must either be the domain administrator or have administrative privileges in the domain.

- *Remove unnecessary files.*

  Decide if you want to migrate .BAK or .LST files, or any other temporary files. You may want to consolidate some files and directories.

  Value Added Processes (VAPs) that are in a directory that you migrate are copied to the destination NetWare v3.12 server, but VAPs are not compatible with v3.12, so you may want to delete them before you start the migration.

  IMPORTANT: The following NetWare v2.1x files are not compatible with NetWare v3.12 and should be deleted.

  IMPORTANT: LARCHIVE.EXE LRESTORE.EXE MACBACK.EXE NARCHIVE.EXE NRESTORE.EXE

If these files are only in SYS:PUBLIC or SYS:SYSTEM, the migration utility blocks them from being transferred. If copies of these files are in other directories, they are transferred.

IMPORTANT: The following NetWare v2.0a files are not compatible with NetWare v3.12. Delete these files also:

IMPORTANT: ENDSPOOL.EXE Q.EXE QUEUE.EXE SPOOL.EXE

- *Prepare Macintosh file support.*

  To store Macintosh files and folders on the new NetWare v3.12 server, add name space support to any volume that needs to store files with long names. For more information, see "Add Name Space" in *Utilities Reference.*

  Install NetWare for Macintosh (a separate Novell product) to provide native-mode support for Macintosh workstations that connect to the v3.12 server.

- *Rename DOS files and directories that have long names.*

  NetWare v2.15 and earlier lets you give directories and files 14-character names.

  NetWare v3.12 allows only DOS naming conventions for DOS directories and files.

  DOS limits filenames to 8 characters with a 3-character extension. (Macintosh and OS/2 files can still follow their respective naming conventions.)

  IMPORTANT: Only files that conform to DOS naming conventions (8.3) are migrated.

  NOTE: If you are migrating from LAN Server, OS/2 extended attributes and long names are not migrated. Files that use extended attributes or long names will be truncated. All files must conform to DOS 8.3 naming conventions.

- *Move SYS:MAIL directory files that you want to keep to a separate tape drive or other backup device.*

  User print job configurations (PRINTCON.DAT) and DOS user login scripts are migrated from SYS:MAIL to the user's new mail directory on the destination server.

  Other files left in the mail directories are not copied to the destination mail directory.

- *Prepare the workstation.*

Make sure the CONFIG.SYS file includes the following line: `files=20`. If you add the line, reboot the workstation. Make sure the NET.CFG file includes the following: `ipx retry count=60`. Load LAN drivers on the DOS workstation and run NETX.COM.

NOTE: In some cases, the setting may already be established or set to a higher value. In such cases, leave the setting at its present value.

NOTE: If you are migrating from LAN Server, use Novell's ODINSUP or LANSUP protocol stack. These products allow for loading dual requesters on DOS clients to allow access to both LAN Server and NetWare server resources. For more information on ODINSUP, see *NetWare Application Notes* articles entitled "ODINSUP Interoperability Configurations for DOS Workstations," (February 1993) or "NetWare and Windows for Workgroups Integration," (March 1993).

Administrative privileges are required from the LAN Server side.

- *Modify the subdirectory depth to 25.*

  NetWare v3.12 sets the default for subdirectory depth to 25 levels, and the migration utility does not copy subdirectories deeper than 25.

  If the source server has subdirectories deeper than 25, modify the subdirectory structure so that the subdirectories aren't so deep. Do this before you start the migration.

- *Plan for space on the destination server.*

  If you merge two or more NetWare v2.x or v3.x servers onto the same NetWare v3.12 server, plan for extra disk space for volume SYS:.

  SYS: requires at least 6 MB of disk space to accommodate additional users and their login scripts.

- *Obtain NLMs to replace third-party VAPs that are running on the v2.x server.*

  VAPs do not run on NetWare v3.12. To find out about NLMs that are available to replace your third-party VAPs, contact your vendor or call Novell product information at 1-800-NETWARE.

- *Run BINDFIX on the source server.*

  BINDFIX can delete mail subdirectories and trustee rights of all users who no longer exist on the source server.

  For more information on "BINDFIX," see *Utilities Reference*.

Across-the-Wire Migration

Across-the-wire migration allows you to migrate your NetWare v2.1x or v3.x server to another physical server on the network that has NetWare v3.12 installed.

Across-the-wire migration includes two options. You can choose either the standard option, explained Step 3, or the custom option, explained "Using the Custom Option" on page 225.

NOTE: If a power failure occurs, or if the migration utility stops while you are running it, restart the utility.

When you restart the utility after a power failure, the entire migration process is repeated. Anything that was successfully migrated previously will exist on the destination server.

For an illustration of this method, see "Across-the-wire Migration" on page 196.

Procedure

1. Create a directory called MIGRATE on your hard drive.

   If you are migrating using a CD ROM, follow Step 1 through Step 6 under "Installing from CD-ROM" on page 32.

   If you are migrating using a network directory, follow Steps 1 through 4 under "Installing from Network Directory" on page 33.

   NOTE: If you are using a network drive instead of a hard drive, you must have Create, Read, Write, and File Scan rights in this directory.

2. Insert the *Migration* diskette into drive A: and type

   ```
   copy a:*.* c:\migrate <Enter>
   ```

   The following files are copied:

Filename	Contents
BRINFO.MSG	Message information while the utility is reading the bindery import data.
BWINFO.MSG	Message information while the utility is writing the bindery export data.
IBM_RUN.OVL	Replaces the IBM$RUN.OVL file used in v2.2 and v3.11.
LSINFO.MSG	Message information while the utility is reading LAN Server import data.

Filename	Contents
MIGRATE.EXE	Executable code for the migration utility.
MIGRATE.EXE	List of elements from the source network operating system that may not translate/ transfer to the destination server.
MIGRATE.HEP	Help screens for the migration utility.
MIGRATE.MSG	Message information for the menus in the utility.
MNCOPY.MSG	Message information during the copying of files.
PCLPINFO.MSG	Message information while the utility is reading PCLP import data.
_RUN.OVL	Replaces the $RUN.OVL file in v2.2 and v3.11.
CPQ_RUN.OVL	Replaces the CPQ$RUN.OVL file in v2.2 and v3.11.
TEXTTUTIL.HEP	Replaces SYS$HELP.DAT.
TEXTUTIL.IDX	Replaces SYS$ERR.DAT.
TEXTUTIL.MSG	Replaces SYS$MSG.DAT.
PCLP13MU.FMT	Used to migrate from PCLP.
PCLP13MU.MSG	Used to migrate from PCLP.
PCLPEXPO.EXE	Used to migrate from PCLP.
LS10MU.FMT	Used to migrate from LAN Server v1.0.
LS10MU.MSG	Used to migrate from LAN Server v1.0.
IBMMIG.DOC	IBM-specific utility file
CPYRIGHT.DAT	IBM-specific utility file

3 Complete the migration by following the procedures under "Using the Standard Option" on page 219, or under "Using the Custom Option" on page 225.

Using the Standard Option

This option migrates all information, including data files and bindery information, from a NetWare v2.x or v3.x server, across the network, to a server that has v3.12 already installed.

With the standard option, you cannot select specific information to migrate. To select specific information, "Using the Custom Option" on page 225.

For an illustration of using the Standard migration option, see "Using the Standard migration option" on page 220.

NOTE: If you are migrating from LAN Server, you must be logged in to the domain you want to migrate from before you run the migration utility.

Procedure

NOTE: You should have the necessary resources (see page 247) and have completed the prerequisite tasks (see page 222).

1. From the directory that contains the migration utility files, type

   ```
   MIGRATE <Enter>
   ```

   The "Select a Migration Option" menu appears.

2. Choose the "Standard Migration" option.

3. From the "Select the Source LAN Type" menu, choose a source LAN type (v2.x, v3.x, LAN Server, or PCLP).

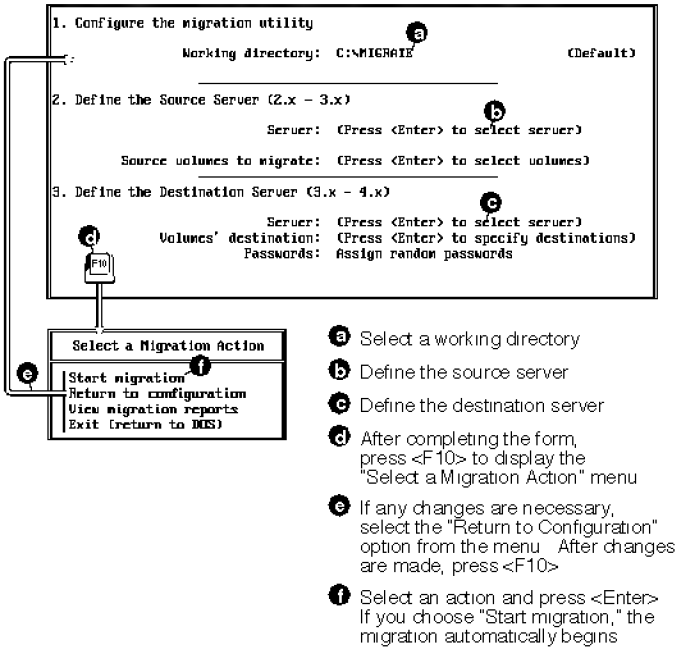
4. From the "Select the Destination LAN Type" menu, choose a destination LAN type (v3.12).

   Once you have selected a source and destination, the migration utility verifies that you selected compatible versions for the migration.

   "Using the Standard migration option" on page 220 illustrates the process of filling out the configuration form used with the standard migration option.

   Each option appears after you have completed the previous option. The corresponding migration steps are noted where applicable.

Figure 69 Using the Standard migration option



5 Under Step 1 on the configuration form, press the Down-arrow key to accept the default working directory or press <Enter> to specify another working directory.

The working directory is where the bindery information and migration reports are stored. Data files are not stored here. You need 5 MB of free disk space in this directory.

Usually, the working directory is located on the hard disk drive of the workstation, but you can also put it on a network drive.

NOTE: If you are using a network drive instead of a hard drive, you must have Create, Read, and Write rights in this directory.

If this directory doesn't exist, the migration utility creates it for you on your hard disk.

Follow the Quick Help to specify a different working directory.

6 Under Step 2 on the configuration form, press <Enter> to display a list of source servers.

NOTE: If you are migrating from LAN Server, the screen shows the domain obtained from the DOSLAN.INI file. Edit this field if the domain you are logged into is not the same as the one listed in the DOSLAN.INI file.

7 Choose the source server that you want to migrate from.

This selection must match the source type you specified in Step 3.

If the NetWare source server you want to select is not shown, press <Ins> to see a list of available servers that you can log in to.

8 Under Step 2 on the configuration form, press <Enter> to display a list of volumes on the source server that you want to migrate files and trustee assignments from.

NOTE: If you are migrating from LAN Server, source drives are listed.

9 Select the volumes using <F5> and then press <Enter>.

Select source volumes to migrate only if you are migrating information that is contained on those volumes.

NOTE: The standard option migrates "ALL" categories.

10 Under Step 3 on the configuration form, press <Enter> to display a list of servers on the network.

11 Choose the NetWare v3.12 destination server that you want to migrate the source server to.

This selection must match the destination type you specified in Step 4.

If the destination server you want to select is not shown, press <Ins> to see a list of available servers that you can log in to.

12 Press <Enter> to display a list of selected source volumes and their default destination volumes.

13 Select a volume (or a source volume in LAN Server) and press <Enter> again to specify the destination volume and directory on the NetWare v3.12 server.

Press <Ins> to see a list of available volumes and directories on the v3.12 server.

NOTE: If you are migrating from LAN Server, the list contains servers and drives.

If you specify a directory that does not exist on the v3.12 server, you are prompted to create it. Volumes must already be created on the destination server before you can migrate to them.

NOTE: The volume organization, as well as the directory structure, is migrated. You can modify the organization on the destination server after all source servers are migrated.

14 Press <Enter> when you complete the destination path of the source volume.

15 Continue to specify destination paths if you have multiple source volumes.

16 Press <F10> when you finish filling out the "Volumes destination" field, and continue with Step 17 to assign user passwords.

17 From the "Passwords" option, press <Enter> and select a password option.

Password Option	Description
Assign random passwords (Default)	A password for each username that has a password on the source is generated randomly and stored in a file (NEW.PWD) in SYS:SYSTEM on the v3.12 destination server. *Note:* New passwords are given only to users and print servers that had a password on the source server. Only users with rights to SYS:SYSTEM have access to this file. Users cannot log in until they are given their passwords.
Assign no passwords	After you finish the migration and bring up the new v3.12 server, users who had a username on the v2.x or v3.x system can log in using their previous username. They are not prompted for a password. Users have the option to create their passwords if no passwords were issued upon migration. *Note:* If user account restrictions require users to have a password, they are prompted to type a new password, which the system verifies.

18 To proceed with the migration, press <F10> to display the "Select a Migration Action" menu.

19 Choose one of the following "Migration Action" options, and then press <Enter>.

To	Select
Migrate all information you selected from the source server to the destination server. (The bindery information you selected is copied to the working directory and translated into the v3.12 format; it is then copied to the NetWare v3.12 server. The data files are migrated directly to the destination v3.12 server.)	Start the Migration
Make changes to your migration configuration.	Return to Configuration
Display reports.	View Migration Reports
Exit the utility and return to the DOS prompt.	Exit (return to DOS)

If you choose "Start the Migration," information about the migration appears on the screen and is entered into a report file, which you can review later.

20 (Conditional) If errors occur during migration, you receive the following message and must answer the question.

```
A migration error has occurred and is displayed
in the migration log above. Do you want to
continue with the migration? (Y=Yes/N=No/I=Ignore
Error):Use the following table to help you answer
the question.
```

If you select	Then
Yes	The migration continues. The error is written to the report file, and you are prompted again the next time an error occurs.
No	The migration stops. The error is written to the report file. You receive this message: `Migration from the source server to the destination server is complete. Press <Enter> to continue.` Press <Enter> to return to the "Select a Migration Action" menu. From there, press <Esc> to edit the fields, or choose "Exit" to leave the utility and return to the DOS prompt.

If you select	Then
Ignore	The migration continues. The error is written to the report file. You are no longer prompted when an error occurs, but all errors are written to the report file.

21 When the migration is complete, the following message appears:

```
Migration from the source server to the NetWare
destination server is complete. Press <Enter> to
continue.
```

22 Press <Enter> to view the "Select a Migration Action" menu.

23 (Optional) From the "Select a Migration Action" menu, select "View Migration Reports" and view the migration report.

23a Select the report for the migration you completed and press <Enter>.

The reports reside in the working directory that you specified earlier.

Use the report to help you complete and customize definitions, attributes, and access privileges on the NetWare v3.12 server.

If you find errors on your destination server after the migration, locate them in the migration report file and determine what actions to take on the destination server to correct the errors.

The report file is an ASCII text file that consists of the following:

- Summary information of the bindery import phase (migrating bindery data from the source server to the working directory).
- Summary information of the bindery export phase (migrating bindery data from the working directory to the destination server).
- A listing of each item in each category that was read from the source server.
- A listing of each item in each category that was written to or created on the destination server.
- The number of errors that occurred during the migration.

23b To exit the report, press <Esc> once.

23c To return to the "Select a Migration Action" menu, press <Esc> again.

24 From the "Select a Migration Action" menu, choose "Exit (return to DOS)."

25 Read "What to Do After the Migration" on page 233.

Using the Custom Option

This option lets you select specific types of information to migrate.

For example, if you don't want to overwrite default account restrictions, you do not have to migrate the account restrictions from any source servers.

For more information on how to customize the destination server, "Setting Up Your Destination Server" on page 209.

NOTE: If you are migrating from a LAN Server, you must be logged in to the domain server you want to migrate from.

Procedure

NOTE: You should have the necessary resources (on page 247) and have completed the prerequisite tasks (on page 222).

1 Start the migration utility by changing to the directory that contains the migration utility files and typing

```
MIGRATE <Enter>
```

The "Select a Migration Option" menu appears.

2 From the "Select a Migration Option" menu, choose the "Custom Migration" option.

3 From the "Select the Type of Migration" menu, choose "Across-the-Wire Migration."

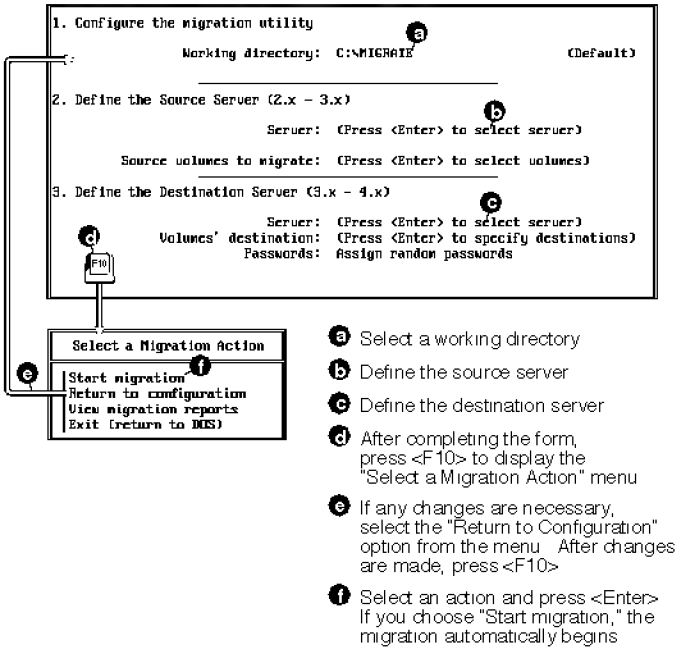
4 From the "Select the source LAN type" menu, choose a source LAN type (v2.x, v3.x, or LAN Server/PCLP).

5 From the "Select the destination LAN type" menu, choose a destination LAN type (v3.x).

When selecting a source and destination, the migration utility does version checking according to the source type and destination type you selected.

"Using the custom option" on page 226 illustrates the process of filling out the configuration form used with the custom migration option. Corresponding migration steps are noted.

Figure 70 Using the custom option



6 Under Step 1 on the configuration form, press the Down-arrow key to accept the default working directory or press <Enter> to specify another working directory.

The working directory is where the bindery information and migration reports are stored. Data files are not stored here. You need 5 MB of free disk space in this directory.

Usually, the working directory is located on the hard disk drive of the workstation, but you can also put it on a network drive.

NOTE: If you are using a network drive instead of a hard drive, you must have Create, Read, Write, and File Scan rights in this directory.

If this directory doesn't exist, the migration utility creates it for you on your hard disk.

Follow the Quick Help to specify a different working directory.

7 Under Step 1 on the configuration form, press <Enter> to select an error/warning action.

Error/Warning Action	Description
Pause after warnings and errors.	Choose this option if you want the utility to stop after each warning and error and prompt you to continue with the migration. Each time an error is reported and you are prompted, you can choose to discontinue the prompting.
Do not pause after warnings and errors.	Choose this option if you do not want to be prompted after each warning and error.

IMPORTANT: All errors are listed in the report file regardless of the option you select.

8 Under Step 2 on the configuration form, press <Enter> to display a list of source servers.

NOTE: If you are migrating from LAN Server, the screen shows the domain obtained from the DOSLAN.INI file. Edit this field if the domain you are logged into is not the same as the one listed in the DOSLAN.INI file.

9 Choose the source server you want to migrate from.

This selection must match the source type you specified in Step 4.

If the NetWare source server you want to select is not shown, press <Ins> to see a list of available servers you can log in to.

NOTE: When migrating multiple source servers, only one source server can be migrated at a time.

10 Under Step 2 on the configuration form, press <Enter> to display categories of information you want to migrate.

NOTE: If you are migrating from LAN Server or PCLP, you are limited to the following categories to migrate: Access Control profiles All information Data files Groups Print queues Users

IMPORTANT: Only files that conform to DOS naming conventions (8.3) are migrated.

11 Using <F5>, mark the information you want to migrate.

Mark as many of the categories as necessary.

Follow the Quick Help for details on how to select information.

"Information that can be migrated using the custom migration option" on page 200 shows the types and descriptions of information you can

migrate from a NetWare source server when you use the custom migration option.

IMPORTANT: If you select "All Information," all categories are migrated.

12 Under Step 2 on the configuration form, press <Enter> again to display a list of source volumes on the source server you want to migrate data from.

NOTE: If you are migrating from LAN Server, source drives are listed.

13 Mark the volumes using <F5>, and then press <Enter>.

Mark source volumes to migrate only if you are migrating data files or trustee assignments on those volumes.

If you are only migrating one or more of the following categories, you do not need to select a source volume:

Accounting Information
Default Account Balance/Restrictions
Groups
Print Queues
User Restrictions
Users

You must select a source volume (or a source drive in LAN Server) to migrate if you select any of the following categories to migrate:

All Information
Data Files
Trustee Assignments (or Access Control permissions in LAN Server)

14 Under Step 3 on the configuration form, press <Enter> to display a list of NetWare servers.

15 Choose the NetWare v3.12 destination server you want to migrate the source server to.

This selection must match the destination type you specified in Step 5.

If the destination server you want to select is not shown, press <Ins> to see a list of available servers that you can log in to.

16 Under Step 3 on the configuration form, select a volume (or source drive in LAN Server) and press <Enter> to specify the destination volume and directory on the NetWare v3.12 server.

Destination volumes that match the source volumes are displayed as the default.

17 Press <Ins> to see a list of available volumes and directories on the NetWare v3.12 server.

NOTE: If you are migrating from LAN Server, the list contains servers and drives.

If you specify a directory that does not exist on the v3.12 server, you are prompted to create it. Volumes must already be created on the destination server before you can migrate data to them.

NOTE: The volume organization, as well as the directory structure, is migrated. You can modify the organization on the destination server after all source servers have been migrated.

18 Press <Enter> when you complete the destination path of the source volume.

19 Continue to specify destination paths if you have multiple source volumes.

20 Press <F10> when you finish filling out the "Volumes destination" field, and continue with Step 21 to assign user passwords.

21 Under Step 3 on the configuration form, press <Enter> to choose a password option.

Password Option	Description
Assign random passwords (Default)	A password for each user that has a password on the source is generated randomly and stored in a file (NEW.PWD) in SYS:SYSTEM on the v3.12 destination server. *Note:*New passwords are given only to users and print servers that had a password on the source server. Only users with rights to SYS:SYSTEM have access to this file. Users cannot log in until they are given their passwords from this list.

Password Option	Description
Assign no passwords	After you finish the migration and bring up the new v3.12 server, users who had a username on the v2.x or v3.x system can log in using their previous username. They are not prompted for a password. Users have the option to create their passwords if no random passwords were issued upon migration. *Note:* If the user account restrictions require users to have a password, they are prompted to type a new password, which the system verifies.

22 To proceed with the migration, press <F10> to display the "Select a Migration Action" menu.

23 Choose one of the following "Migration Action" options and then press <Enter>.

To	Select
Migrate all information you selected from the source server to the destination server. If you choose this option, the migration starts automatically. (The bindery information you selected is copied to the working directory and translated into the v3.12 format, and then copied to the NetWare v3.12 server. The data files are migrated directly to the v3.12 server.)	Start the migration
Make changes to your migration configuration.	Return to configuration
Display reports.	View migration reports
Exit the utility and return to the DOS prompt.	Exit (return to DOS)

If you select "Start the Migration," all information about the migration is displayed on the screen and entered into a report file, which you can review later.

24 (Conditional) If errors occur during migration and you chose to be prompted after errors and warnings, you receive the following error message and must answer the question.

A migration error has occurred and is displayed in the migration log above. Do you want to continue with the migration? (Y=Yes/N=No/I=Ignore Error):

Use the following table to help you answer the question.

If you select	Then
Yes	The migration continues. The error is written to the report file and you are prompted again the next time an error occurs.
No	The migration stops. The error is written to the report file. You receive this message: `Migration from the source server to the destination server is complete. Press <Enter> to continue.` Press <Enter> to return to the "Select a Migration Action" menu. From there, press <Esc> to edit the fields, or choose "Exit" to leave the utility and return to the DOS prompt.
Ignore	The migration continues. The error is written to the report file. You are no longer prompted when an error occurs, but all errors are written to the report file.

25 When the migration is complete, the following message appears:

Migration from the source server to the destination server is complete. Press <Enter> to continue.

26 Press <Enter> to view the "Select a Migration Action" menu.

27 (Optional) From the "Select a Migration Action" menu, select "View Migration Reports" and view the migration report.

27a Select the report for the migration you completed and press <Enter>.

The reports reside in the working directory that you specified earlier.

Use the report to help you complete and customize definitions, attributes, and access privileges on the v3.12 server.

If you find errors on your destination server after the migration, locate them in the migration report file and determine what actions to take on the destination server to correct the errors.

The report file is an ASCII text file that consists of the following:

- Summary information of the bindery import phase (migrating bindery data from the source server to the working directory).
- Summary information of the bindery export phase (migrating bindery data from the working directory to the destination server).
- Listing of each item in each category that was read from the source server.
- Listing of each item in each category that was written to or created on the destination server.
- The number of errors that occurred during the migration.

27b To exit the report, press <Esc> once.

27c To return to the "Select a Migration Action" menu, press <Esc> again.

28 From the "Select a Migration Action" menu, choose "Exit (return to DOS)."

29 Read "What to Do After the Migration" on page 233.

What to Do After the Migration

After the migration is complete, check the NetWare v3.12 server and do the following:

- Update references to the server in user login scripts.

  Although user login scripts are migrated, they are not modified, and server names and directory paths are not changed to match your new environment.

- Run third-party applications. You may have to reinstall them to work properly under NetWare v3.12. You may also need to enter new paths in the setup files for third-party applications.

- Check applications to see if they run properly. The following conditions require you to reinstall an application:

- The application has an .EXE file that will not migrate.

- The application is path-specific and you changed the path structure during migration.

  Some DOS applications don't work when installed on volumes that have more than 32 MB of disk space. Some of these applications can be made to work by doing the following:

- Restrict the application's disk space on the destination server with DSPACE in the application's directory.

- Make the directory a fake root with MAP (see "Fake Root" in *Concepts*).

- Examine the files in merged directories and reorganize them if necessary. Any directories that were merged may contain unrelated files.

- Update migrated print queues and print servers.

- Check user restrictions and accounting charge rates to make sure your system is configured the way you want it.

- If you chose to assign random passwords, you may want to print the NEW.PWD file and distribute the password information to your users. The users should change their passwords immediately.

  The report, an ASCII text file, shows passwords sorted by date. If users were migrated from more than one server, the current password is the last one listed on the report.

- Check print servers and print queues to make sure they are configured correctly. Also make sure that the physical printer connection is secure. Use the NetWare print utilities to accomplish these tasks.

  NOTE: Also, if you are migrating from LAN Server, set up print servers and print queues.

Same-Server Migration

Use the same-server migration to update a server that will be installed on the same hardware as the old server, allowing you to change your NetWare v2.x server to a NetWare v3.12 server.

NOTE: If you are running RCONSOLE, make sure you use the latest version of the shell.

For an illustration of same-server migration, see "Same-Server Migration" on page 198.

WARNING: The same-server method does involve some risk to your data files as a result of the conversion process to NetWare v3.12.

Necessary Resources

- The NetWare Migration Utility files located on the *Migration* diskette.
- A DOS workstation with at least 640 KB of memory and 5 MB of free disk space on either a hard drive or another network drive.

  Be sure the following line is in the CONFIG.SYS file: files=20. Be sure the following line is in the NET.CFG file: ipx retry count=60.
- A NetWare v2.1x or v3.x server with a 386 or higher processor.
- A network with a DOS workstation (using NETx.COM v3.02 or later) and a NetWare v2.x source server (or LAN Server or PCLP).
- A backup device for data storage.

Prerequisites

- Back up the data from your source server.

  Use your regular backup utility to back up your current NetWare server at least twice to ensure a good copy.

WARNING: The NetWare same-server migration procedure destroys *all* data on your hard disk. Back up trustees or bindery information. The migration utility converts the trustees and bindery information to NetWare v3.12 format.

- Make sure that all users, except SUPERVISOR, are logged out of the source and destination servers (this includes print servers) and that all files (except bindery files) are closed during migration.

  NOTE: If you are migrating from LAN Server, you must either be the domain administrator or have administrative privileges in the domain.

- Remove unnecessary files.

  Decide if you want to migrate .BAK or .LST files, or any other temporary files. You may want to consolidate some files and directories.

  Value Added Processes (VAPs) that are in a directory that you migrate are copied to the destination v3.12 server, but VAPs are not compatible with NetWare v3.12, so you may want to delete them before you start the migration.

  The following NetWare v2.1x files are not compatible with NetWare v3.12.

  IMPORTANT: Delete the following files:

  IMPORTANT: LARCHIVE.EXE LRESTORE.EXE MACBACK.EXE NARCHIVE.EXE NRESTORE.EXE

  If these files are only in SYS:PUBLIC or SYS:SYSTEM, the migration utility blocks them from being transferred. If copies of these files are in other directories, they are transferred.

  IMPORTANT: The following NetWare v2.0a files are not compatible with NetWare v3.12. Delete these files also:

  IMPORTANT: ENDSPOOL.EXE Q.EXE QUEUE.EXE SPOOL.EXE

- Rename DOS files and directories that have long names.

  Although NetWare v2.15 and earlier lets you give directories and files 14-character names, NetWare v3.12 allows only DOS naming conventions for DOS directories and files.

  DOS limits filenames to 8 characters with a 3-character extension. (Macintosh files can still follow Macintosh naming conventions.)

  WARNING: Only files that conform to DOS naming conventions (8.3) are migrated.

NOTE: If you are migrating from LAN Server, OS/2 extended attributes and long names are not migrated. Files that use extended attributes or long names can be truncated. All files must conform to DOS 8.3 naming conventions.

- Move files that you want to keep out of the SYS:MAIL directory.

  User print job configurations (PRINTCON.DAT) and DOS user login scripts are migrated from SYS:MAIL to the user's new mail directory on the destination server.

  Other files left in the mail directories are not copied to the destination mail directory.

- Prepare the workstation.

  Make sure the CONFIG.SYS file includes the following line: `files=20`. If you had to add the line, reboot the workstation. Make sure the NET.CFG file includes the following line: `ipx retry count=60`. Load your LAN drivers on the DOS workstation and run NETX.COM.

  NOTE: In some cases, the setting may already be established or set to a higher value, in such cases, leave the setting at its present value.

  NOTE: If you are migrating from LAN Server, use Novell's ODINSUP or LANSUP protocol stack. These products allow for loading dual requesters on DOS clients to allow access to both LAN Server and NetWare server resources. Administrative privileges are required from the LAN Server side.

- Plan for space on the destination server.

  If you are merging two or more NetWare v2.x servers onto the same NetWare v3.12 server, plan for extra disk space for volume SYS:.

  SYS: requires at least 6 MB of disk space to accommodate additional users and their login scripts.

- Obtain NLMs to replace third-party VAPs running on the v2.x server.

  VAPs do not run on a NetWare v3.12 system. To find out about NLMs that are available to replace your third-party VAPs, contact your vendor or call Novell product information at 1-800-NETWARE.

- Run BINDFIX on the source server.

  BINDFIX can delete mail subdirectories and trustee rights of all users who no longer exist on the source server.

  For more information on "BINDFIX," see Utilities Reference.

  NOTE: If you are migrating from LAN Server, you must be logged in to the domain server you want to migrate from.

Using the Same-Server Migration Method

Procedure

1. Create a directory called MIGRATE on your hard drive.

   If you are using a network drive instead of a hard drive, you must have Create, Read, and Write rights in this directory.

2. Insert the *Migration* diskette into drive A: and type

   ```
   copy a:*.* c:\migrate <Enter>
   ```

   The following files are copied:

Filename	Contents
BRINFO.MSG	Message information while the utility is reading the bindery import data.
BWINFO.MSG	Message information while the utility is writing the bindery export data.
IBM_RUN.OVL	Replaces a file of the same name used in v2.2 and v3.11.
LSINFO.MSG	Message information while the utility is reading LAN Server import data.
MIGRATE.EXE	Executable code for the migration utility.
MIGRATE.EXP	List of elements from the source network operating system that may not translate/ transfer to the destination server.
MIGRATE.HEP	Help screens for the migration utility.
EMIGRATE.MSG	Message information for the menus in the utility.
MNCOPY.MSG	Message information during the copying of files.
PCLPINFO.MSG	Message information while the utility is reading PCLP import data.
_RUN.OVL	Replaces a file of the same name used in v2.2 and v3.11.
CPQ_RUN.OVL	Replaces a file of the same name used in v2.2 and v3.11.
TEXTTUTIL.HEP	Replaces SYS$HELP.DAT.
TEXTUTIL.IDX	Replaces SYS$ERR.DAT.
TEXTUTIL.MSG	Replaces SYS$MSG.DAT.
PCLP13MU.FMT	Used to migrate from PCLP.

Filename	Contents
PCLP13MU.MSG	Used to migrate from PCLP.
PCLPEXPO.EXE	Used to migrate from PCLP.
LS10MU.FMT	Used to migrate from LAN Server v1.0.
LS10MU.MSG	Used to migrate from LAN Server v1.0.
LS10EXPO.EXE	Used to migrate from LAN Server v1.0.
IBMMIG.DOC	IBM-specific utility file
CPYRIGHT.DAT	IBM-specific utility file

Start the Same-Server Migration

Procedure

1. Have the necessary resources (on page 247) and complete the prerequisite tasks (on page 222).
2. Start the migration utility by moving to the directory that contains the migration utility files and typing

   `MIGRATE <Enter>`

   The "Select a Migration Option" menu appears.
3. Choose the "Custom Migration" option.

   This option lets you select specific types of information to migrate.

   For example, if you don't want to overwrite default account restrictions, you do not have to migrate the default account restrictions from the source server.

   For more information on how to customize the destination server, "Setting Up Your Destination Server" on page 209.

   See "Using the same-server custom migration option" on page 239 for an illustration of the custom migration option.
4. From the "Select the Type of Migration" menu, choose "Same-Server migration."

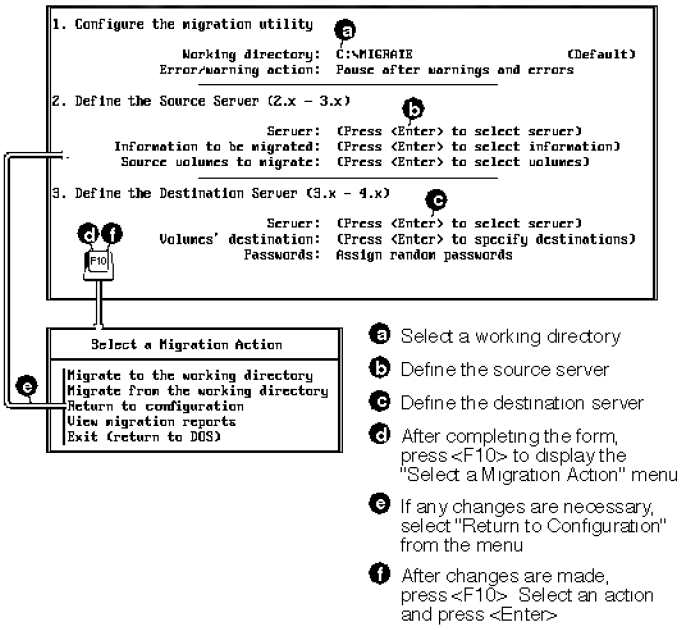
The same-server option allows you to stop the utility after you migrate the bindery information to the working directory so that you can install NetWare v3.12.

5 From the "Select the source LAN type" menu, choose a source LAN type (v2.x, v3.x, LAN Server/PCLP).

6 From the "Select the destination LAN type" menu, choose a destination LAN type (v3.12).

Once you have selected a source and destination, the migration utility verifies that you selected compatible versions for the migration.

Figure 71 Using the same-server custom migration option



7 Under Step 1 on the configuration form, press the Down-arrow key to accept the default working directory or press <Enter> to specify another working directory.

The working directory is where the bindery information and migration reports are stored.

Usually, the working directory is located on the hard disk drive of the workstation, but you can also put it on a network drive. You need 5 MB free disk space in this directory.

NOTE: If you use a network drive instead of a hard drive, you must have Create, Read, and Write rights in this directory.

If this directory doesn't exist, the migration utility creates it for you on your hard disk.

Follow the Quick Help to specify a different working directory.

8 Under Step 1 on the configuration form, press <Enter> to select an error/warning action.

Error/Warning Action	Description
Pause after warnings and errors	Choose this option if you want the utility to stop after each warning and error and prompt you to continue with the migration. Each time an error is reported and you are prompted, you can choose to discontinue the prompting.
Do not pause after warnings and errors	Choose this option if you do not want to be prompted after each warning and error.

IMPORTANT: All errors are listed in the report file regardless of the option you select.

9 Under Step 2 on the configuration form, press <Enter> to display a list of source servers.

NOTE: If you are migrating from LAN Server, the screen shows the domain obtained from the DOSLAN.INI file. Edit this field if the domain you are logged into is not the same as the one listed in the DOSLAN.INI file.

10 Choose the source server you want to migrate from.

This selection must match the type you specified in Step 5.

If the source server you want to select is not shown, press <Ins> to see a list of available servers that you can log in to.

11 Under Step 2 on the configuration form, press <Enter> to display categories of information you want to migrate.

NOTE: If you are migrating from LAN Server or PCLP, you are limited to the following categories to migrate: Access Control profiles All information Groups Print queues Users

12 Using <F5>, mark the information you want to migrate.

Mark as many of the categories as necessary.

Follow the Quick Help for details on how to select information.

For a description of each category, see "Evolution of directory and file rights" on page 203.

13 Under Step 2 on the configuration form, press <Enter> to display a list of source volumes on the source server that you want to migrate trustee assignments from.

NOTE: If you are migrating from LAN Server, source drives are listed.

14 Mark the volumes using <F5>, then press <Enter>.

Mark source volumes to migrate only if you are migrating information that is contained on those volumes.

For example, you do not need to mark a source volume if you are only migrating any of the following categories:

Accounting Information
Default Account Balance/Restrictions
Groups
Print Queues
User Restrictions
Users

You must select a source volume to migrate if you select either All Information or Trustee Assignments.

15 Review the fields on the configuration form and make necessary changes.

You cannot complete the information for the destination server, since it does not yet exist.

After you migrate the source information and install NetWare v3.12, you return to the migration utility and complete the destination server information.

16 To proceed with the migration, press <F10> to display the "Select a Migration Action" menu.

17 Select "Migrate to the Working Directory," then press <Enter>.

All information about the migration is displayed on the screen and is entered into a report file which you can review later.

18 (Conditional) If errors occur during migration and you chose to be prompted after errors and warnings, you receive the following error message and must answer the question.

```
A migration error has occurred and is displayed
in the migration log above. Do you want to
continue with the migration? (Y=Yes/N=No/I=Ignore
Error):
```

Use the following table to help you answer the question.

If you select	Then
Yes	The migration continues. The error is saved in the report file and you are prompted the next time an error occurs.
No	The migration stops. The error is written to the report file. You receive this message: `Migration is complete.Press <Enter> to continue.` Press <Enter> to return to the "Select a Migration Action" menu. From there, press <Esc> to edit the fields, or choose "Exit" to leave the utility and return to the DOS prompt.
Ignore	The migration continues. The error is written to the report file. You aren't prompted when an error occurs, but all errors are saved in the report file.

19 When the migration to the working directory is complete, the following message appears.

```
Migration from the working directory is complete.
Press <Enter> to continue.
```

20 Press <Enter> to view the "Select a Migration Action" menu.

21 (Optional) From the "Select a Migration Action" menu, select "View Migration Reports" and view the migration report.

21a Select the report for the migration you completed and press <Enter>.

The reports reside in the working directory that you specified earlier.

Use the report to help you complete and customize definitions, attributes, and access privileges on the NetWare v3.12 server.

If you find errors on your destination server after the migration, locate them in the report and determine what actions to take on the destination server.

The report file is an ASCII text file that consists of

- Summary information of the bindery import phase (migrating bindery data to the working directory).
- A listing of each item in each category that was read from the source server.
- The number of errors that occurred during the migration.

21b To exit the report, press <Esc> once.

21c To return to the "Select a Migration Action" menu, press <Esc> again.

22 To exit the utility, choose "Exit (Return to DOS)."

23 Install NetWare v3.12 on the server.

Follow the instructions under "Complete the Upgrade to NetWare v3.12 Using INSTALL.NLM" on page 278 to install your NetWare v3.12 server.

24 Prepare Macintosh file support.

To store Macintosh files and folders on the new NetWare v3.12 server, add name space support to any volume that needs to store files with long names. For more information, see "Add Name Space" in *Utilities Reference*.

NOTE: Install NetWare for Macintosh (a separate Novell product) to provide native-mode support for Macintosh workstations that connect to the v3.12 server.

25 Restore the data files from your backup device to a network directory on the NetWare v3.12 server.

Make a note of where you restore the data files so that you can direct the bindery information to the correct location.

26 Restart the migration utility by changing to the directory where the migration utility files are and typing

```
MIGRATE <Enter>
```

The "Select a Migration Option" menu appears.

NOTE: Make sure that the working directory is the same one you used when you migrated from the source server to the working directory.

27 Choose the "Custom Migration" option.

28 From the "Select the Type of Migration" menu, choose "Same- Server migration."

29 From the "Select Source LAN Type" menu, choose a source LAN type (NetWare v2.x or LAN Server/PCLP).

This should be the same source LAN type you selected in Step 5.

30 From the "Select the Destination LAN Type" menu, choose a destination LAN type (v3.12).

This should be the same destination LAN type you selected in Step 6.

31 (Optional) Change the "Error/Warning" prompt if you want.

32 Move the cursor to Step 3 on the configuration form and press <Enter> to display a list of NetWare servers.

IMPORTANT: Do not change the source server information on the configuration form.

33 Choose the NetWare v3.12 destination server that you want to migrate the source server information to.

Choose the NetWare v3.12 server you just installed.

34 Press <Enter> to display a list of selected source volumes and their default destination volumes.

Destination volumes that match the source volumes are displayed as the default.

35 Select a volume and press <Enter> to specify the destination volume and directory on the NetWare v3.12 server.

Press <Ins> to see a list of available volumes and directories on the v3.12 server.

NOTE: If you are migrating from LAN Server, the list contains servers and drives.

If you specify a directory that does not exist on the v3.12 server, you are prompted to create it. Volumes must already be created before you can migrate them.

36 Press <Enter> when you have completed the destination path of the source volume.

37 Continue to specify destination paths if you have multiple source volumes.

38 Press <F10> when you finish filling out the "Volumes destination" field.

39 Under Step 3 on the configuration form, press <Enter> and choose a password option.

Password Option	Description
Assign random passwords (Default)	A password for each user that has a password on the source is generated randomly and stored in a file (NEW.PWD) in SYS:SYSTEM on the v3.12 server. *Note:*New passwords are given only to users and print servers that had a password on the source server. Only users with rights to SYS:SYSTEM have access to this file. Users cannot log in until they are given their passwords from this list.
Assign no passwords	After you finish the migration and bring up the new NetWare v3.12 server, users who were on the v2.x or v3.11 system can log in using their previous username. They aren't prompted for a password. Users have the option to create their password if no password was chosen upon migration. *Note:* If the user account restrictions require users to have a password, they are prompted to type a new password, which the system verifies.

40 Review the fields on the configuration form and make necessary changes.

IMPORTANT: Do not change the information in the source server area.

41 To proceed with the migration, press <F10> to display the "Select a Migration Action" menu.

42 Select "Migrate from Working Directory."

All information about the migration displays on the screen and goes into a report file, which you can review later.

When the migration from the working directory is complete, the migration utility notifies you.

43 (Conditional) If errors occur during migration and you chose to be prompted after errors and warnings, you receive the following error message and must answer the question.

```
A migration error has occurred and is displayed
in the migration log above. Do you want to
continue with the migration? (Y=Yes/N=No/I=Ignore
Error):
```

If you select	Then
Yes	The migration continues. The error is written to the report file, and you are prompted again the next time an error occurs.
No	The migration stops. The error is written to the report file. You receive this message: `Migration from the working directory is complete. Press <Enter> to continue.` Press <Enter> to return to the "Select a Migration Action" menu. From there, press <Esc> to edit the fields, or choose "Exit" to leave the utility and return to the DOS prompt.
Ignore	The migration continues. The error is written to the report file. You are no longer prompted when an error occurs, but all errors are written to the report file.

When the migration is complete, the following message appears.

```
Migration from the working directory to the
NetWare destination server is complete. Press
<Enter> to continue.
```

44 Press <Enter> to view the "Select a Migration Action" menu.

45 (Optional) From the "Select a Migration Action" menu, select "View Migration Reports" and view the migration report.

45a Select the report for the migration you completed.

The reports reside in the working directory that you specified earlier.

Use the report to help you complete and customize definitions, attributes, and access privileges on the v3.12 server.

If you find errors on your destination server after the migration, review the migration report to see if you can find where they occurred.

The report file is an ASCII text file that consists of the following:

- Summary information of the bindery export phase (migrating bindery data from the working directory to the destination server).
- Listing of each item in each category that was read from the source server.
- Listing of each item in each category that was written to or created on the destination server.
- The number of errors that occurred during the migration.

45b To exit the report, press <Esc> once.

45c To return to the "Select a Migration Action" menu, press <Esc> again.

46 To exit the migration utility, select "Exit (Return to DOS)."

47 Read "What to Do After the Migration" on page 247

What to Do After the Migration

After the migration is complete, check the v3.12 server and do the following if they apply:

- Update references to the server in user login scripts if you changed the server name.

  Although user login scripts are migrated, they are not modified, and server names and directory paths are not changed to match your new environment.

- Run third-party applications. You may have to reinstall them to work properly under NetWare v3.12. You may also need to enter new paths in the setup files for any third-party applications.

- Check applications to see if they run properly. The following conditions require you to reinstall an application:
- The application has an .EXE file that did not migrate.
- The application is path-specific and you changed the path structure during migration.

  Some DOS applications don't work when installed on volumes that have more than 32 MB of disk space. Some of these applications can be made to work by doing the following:
- Restrict the application's disk space on the destination server using DSPACE in the application's directory.
- Make the directory a fake root with MAP.
- Check user restrictions and accounting charge rates to make sure your system is configured the way you want it.
- If you chose to assign random passwords, you may want to print the NEW.PWD file and distribute the password information to your users. The users should change their passwords immediately.

  The report, an ASCII text file, shows passwords sorted by date. If users were migrated from more than one server, the current password is the last one listed on the report.
- Check print servers and print queues to make sure they are configured correctly. Also make sure that the physical printer connection is secure. Use the NetWare print utilities to accomplish these tasks.

  NOTE: If you are migrating from LAN Server, set up print servers and print queues.

10 Upgrade Using In-Place Upgrade

Overview

This chapter covers the procedures for upgrading an existing NetWare server using the In-Place Upgrade.

Use the In-Place Upgrade for upgrading from an existing NetWare v2.1x, v2.2 to a v3.11 or v3.12 server.

If you are upgrading an existing NetWare v3.x server, follow the procedures under "NetWare v3.x to v3.12 Upgrade" on page 276.

NetWare v2.1x or v2.2 Upgrade

NOTE: References in this section to NetWare v2.1x include NetWare v2.2.

A NetWare v2.1x server must have a 386 or higher processor to be upgraded to a v3.12 server.

If your NetWare 2.1x server uses a 286 processor, see "Upgrade Using Migration" on page 213.

NetWare v2.0 and v2.0a are not supported by In-Place Upgrade.

Necessary Resources

- A working copy of the NetWare system diskettes (see "Make Working Copies of the NetWare Diskettes" on page 27).
- A NetWare server running versions 2.10, 2.11, 2.12, 2.15 (revisions a, b, and c), or 2.2.
- A computer with a 386 or higher processor with a minimum of 4 MB of RAM. NetWare v3.x does not run on a 286 processor.

Servers with large disks and a large number of directories may need more memory to complete the upgrade than they would normally need to run the server after the upgrade.

- A backup device, such as a tape drive or a DOS hard drive.
- Enough disk space to accommodate the v3.12 file system. Each volume should have at least 10% free disk space to accommodate the enlarged directory and file allocation tables.

  To store the v3.12 operating system files, we recommend you reserve 30 to 40 MB on volume SYS:.

  We also recommend that you create at least a 5MB DOS partition on the disk containing volume SYS:.

  Ensure that no disk has more than eight volumes on it.
- The NetWare *System_1* diskette which contains the 2XUPGRDE.NLM.
- Sufficient time to upgrade your server. This depends on the following conditions:
  - The number of hard disks, not including mirrored disks
  - The amount of disk space in use

    If you have several disks, and a lot of disk space in use, this upgrade could take several hours.
- (Optional) NetWare for Macintosh (to support Macintosh files on your network).

Prerequisites

- If you are running NetWare v2.1x on a 286 processor, upgrade your computer to a 386 or higher processor.
- Back up your v2.1x system twice to ensure that you have a good backup.

  A backup is essential if you must restore your v2.1x system.
- Make sure all users are logged out and all files (except bindery files) are closed during the upgrade.
- Make sure all print servers are logged out.
- You may need updated disk and LAN drivers to run v3.12. If you have third-party drivers, check with the manufacturer before you upgrade to see if you have compatible versions.

WARNING: If you are using the IDE.DSK disk driver, you cannot add a DOS partition to an upgraded v3.12 disk.

Claiming a DOS partition with FDISK on an upgraded IDE disk causes the IDE.DSK driver to get its parameters for heads, sectors, and cylinders from the CMOS tables instead of from the disk drive.

The different parameters cause the DOS and NetWare partitions to overlap, resulting in data loss or data corruption.

The NetWare partition will also be read from and written to erroneously with the wrong drive parameters.

This problem occurs since the NetWare v2.1x IDE disk driver did not conform to the same specifications as DOS.

The IDE driver is designed to check for the existence of a DOS partition. If a DOS partition exists, then the driver uses the drive parameters from the CMOS tables so that they will match what DOS is using. Otherwise, the driver will use the drive parameters from the NetWare v2.1x partition on the IDE disk drive.

Boot NetWare v3.12

Procedure

IMPORTANT: Keep a record of your hardware configuration information to be used at a later stage of the upgrade, as well as for future reference.

1. At the NetWare v2.1x server system console prompt (:), type

   CONFIG <Enter>

2. Copy the following information from the server screen onto the NetWare v3.12 Server Worksheet provided at the back of this manual:

   - Server name
   - LAN configuration information (including the network address)
   - Disk channel configuration information

3. From a workstation, run BINDFIX.

   NOTE: You must have rights to the SYS:SYSTEM directory to run BINDFIX.

   BINDFIX deletes mail subdirectories and trustee rights of users who no longer exist on the network and fixes the incorrect records in the bindery.

   To delete mail subdirectories and trustee rights, answer "Y" to the questions presented during BINDFIX.

HINT: You may want to copy the NET$BIND.OLD and NET$BVAL.OLD files to diskette to recover the bindery later if needed.

For more information on "BINDFIX," see *Utilities Reference*.

4 Down the NetWare v2.1x server.

At the system console prompt (:), type

```
DOWN <Enter>
```

IMPORTANT: Do *not* down the server simply by turning its power switch to OFF. This creates errors when upgrading to a NetWare v3.x file system.

IMPORTANT: After the server responds that it is down, wait two to three minutes to be sure that all transactions to system files are complete before turning the power off.

5 Run VREPAIR.

From the downed server, run the NetWare v2.1x VREPAIR utility on each volume.

See the v2.1x VREPAIR documentation for further instructions.

6 Insert the bootable *INSTALL* diskette into drive A:.

If you are upgrading from CD ROM, follow Step 1 through Step 6 under "Installing from CD-ROM" on page 32.

If you are upgrading from a network directory, follow Steps 1 through Step 4 under "Installing from Network Directory" on page 33.

7 Turn the server off and then on again.

The computer now boots with DR DOS 6.0.

NOTE: If you are creating a DOS partition on the hard drive, record the information you enter in Step 8 through Step 13 on the worksheet at the end of this manual. You use this information again later.

8 With the *System_1* diskette in drive A:, load the v3.12 operating system by typing

```
SERVER <Enter>
```

You receive a message similar to the following:

```
Loading...System ConsoleNovell NetWare
v3.12Processor speed: 193(Type SPEED at the
command prompt for an explanation of the speed
rating)File server name:
```

NOTE: Don't type "SPEED" at this prompt (unless you want to name the server "SPEED").

For an explanation of the speed rating (which is computer-specific), wait until after you name the server and give it an internal network number before you type SPEED at the console prompt.

9 Name the server by typing

`servername <Enter>`

HINT: Use your NetWare v2.1x servername so that you do not have to change any login files, map statements, or batch files.

10 Assign an IPX internal network number to the server.

This number does not exist on a NetWare v2.1x network. In versions 3.0, 3.1, 3.11, and 4.0, it is a logical network number that identifies the individual file server.

This number must be different from other network numbers (for cabling systems) or internal network numbers (for NetWare v3.0, v3.1, v3.11, v3.12, and 4.0 file servers).

The internal network number for each server must be

- Unique
- Hexadecimal (base 16: using numbers 0 through 9 and letters A through F)
- One to eight digits

11 At the cursor prompt, type the IPX internal network number and press <Enter>.

The v3.12 console prompt (:) appears. The remaining steps are executed from the console prompt.

12 Load the appropriate disk driver by typing

`LOAD A:disk_driver <Enter>`

Replace *disk_driver* with one of the NetWare v3.12 drivers from "NetWare v3.12 disk drivers" on page 254.

Table 23 NetWare v3.12 disk drivers

Computer architecture	Disk controller type	NetWare v3.12 disk driver (*.DSK)
Industry Standard Architecture (ISA)	AT, MFM, RLL, ARLL	ISADISK.
	ESDI	ISADISK /b.
	IDE	ISADISK /b /l (lowercase "L").
		IDE (You cannot add a DOS partition to an upgraded v3.11 or v3.12 IDE disk.)
	Novell disk coprocessor board	DCB.
Microchannel	ESDI	PS2ESDI.
	MFM	PS2MFM.
	IBM SCSI	PS2OPT (replaces PS2SCSI).
Extended Industry Standard Architecture (EISA)	AT class	ISADISK.
	EISA vendor proprietary	See vendor.
		Other devices may be supported.
		Contact the device manufacturer to find out if it has a v3.12-supported driver.

To decide which disk drivers to load, look at the disk channel configuration information you recorded in Step 2. Load the equivalent NetWare v3.12 disk driver.

Many more third-party disk drivers are also included on the NetWare v3.12 *System_4* diskette. Third-party disk driver manufacturers include

Adaptec
ADIC
Always Technology
Bus Logic
Data Technology Corp.
DPT
Future Domain
Quantum
UltraStor

IMPORTANT: Load the disk drivers in the order of the controller boards. Load the driver for the internal controller first, the driver for the first disk controller board second, etc.

IMPORTANT: If you do not follow the correct order, system messages about your hard disks will be incorrect.

13 Answer the disk driver configuration information prompts by entering the information you recorded in Step 2.

In NetWare v2.x, the interrupt number was decimal. In NetWare v3.x, the interrupt number is hexadecimal.

14 (Optional) To test third-party LAN drivers for compatibility, load them by typing

```
LOAD A: LAN_driver <Enter>
```

Replace *LAN_driver* with the third-party v3.12 LAN driver.

"NetWare v3.12 LAN drivers" on page 256 lists all LAN drivers supported by Novell, Inc.

WARNING: Do not upgrade if LAN drivers are not compatible. Call the manufacturer to get an updated version of the driver.

WARNING: If you experience problems with third-party drivers, contact the manufacturer listed in the driver description that appears when you load the driver.

Table 24 NetWare v3.12 LAN drivers

Cabling System	Network Board	v3.12 LAN Driver
ARCnet	RX-Net RX-Net II RX-Net/2	TRXNET
Ethernet	NE/2 NE/2T	NE2
	NE/2-32	NE2_32 (replaces NE2-32)
	NE1000 - ASSY 950-054401 NE1000 - ASSY 810-160-001	NE1000
	NE2000 - ASSY 810-149 NE2000T - ASSY 810-000220 NE2000 Plus	NE2000
	NE2100 - ASSY 810-000209	NE2100
	NE1500T - ASSY 810-000214	NE1500T
	NE3200	NE3200
	NE32HUB	NE32HUB
Token ring	NTR2000	NTR2000

Many more third-party LAN drivers are also included on the NetWare v3.12 *System_4* diskette. Third-party LAN driver manufacturers include

3COM
Cabletron
Hewlett-Packard
IBM
Intel
Madge
NCR
Proteon
Racal Datacom
Standard Microsystems
Thomas-Conrad
Ungermann-Bass

15 (Optional) Answer the LAN driver configuration information prompts by entering the information you recorded in Step 2.

If the LAN driver loads, it can communicate with the network board and is compatible with NetWare v3.12.

If the LAN driver does not load, it is either incompatible with v3.12 or the configuration is wrong.

The following message appears:

```
Module xxx.LAN not loaded.
```

Check the configuration and try again. If you're sure the configuration is correct, find out if you have the correct driver version.

16 (Optional) Unload the third-party LAN drivers to free the memory for the upgrade by typing

UNLOAD *LAN_driver* <Enter>

17 Insert the *System_1* diskette in drive A: and load Macintosh name space support by typing

LOAD A:MAC <Enter>

Loading the Macintosh name space module ensures that all volumes are mounted properly at the phase 4 bindery step.

18 Continue the upgrade by determining which upgrade option to use. See "Choose In-Place Upgrade Options" on page 257.

Choose In-Place Upgrade Options

Before doing an In-Place Upgrade, decide the following:

- Run the upgrade interactively?
- Run the upgrade as a batch process?

The following sections discuss both options to help you make your decisions and then give you instructions for completing each task.

Run the Upgrade Interactively?

When you run the upgrade interactively, you are prompted whether to continue from one phase of the upgrade to the next, whether to create space for a DOS partition, and whether to have the NLM create and assign new passwords.

Status messages and error messages are displayed.

If you are a first time installer, use the interactive method so you can follow each phase of the upgrade.

Run the Upgrade as a Batch Process?

When you run the upgrade as a batch process, only error and status messages are displayed. The upgrade automatically proceeds through the phases without requiring input from the user.

Use the optional parameters described on the next page to create space for a DOS partition and to assign random passwords to users. If no options are specified, the defaults are used.

If you are an experienced installer and have run several upgrades, use the batch process method, especially if you are upgrading several servers.

Run the In-Place Upgrade

NOTE: The optional parameters shown in "In-Place Upgrade optional parameters" on page 258 can be entered whether the upgrade is run interactively or as a batch process.

1. Make sure the *System_1* diskette is still in drive A:.
2. (Conditional) To run the upgrade interactively, type

   `LOAD A:2XUPGRDE <Enter>`

   A warning screen appears. You are asked the following question:

   `Do you have a recent backup of your server? y`

   Skip to Step 4.
3. (Conditional) To run the upgrade as a batch process, type

   `LOAD A:2XUPGRDE optional parameters <Enter>`

   Replace optional parameters with any of the following:

Table 25 In-Place Upgrade optional parameters

Parameter	Explanation
B or BATCH	Runs the upgrade in batch mode.
BATCH2	Runs the upgrade in batch mode, not pausing for non- critical errors.

Parameter	Explanation
BINDERY	Skips to phase 4 to upgrade the v2.1x bindery only.
F or FAST	Skips the memory and free disk space check.
H, ? or HELP	Shows a list of parameters.
P0	Does not create space for a DOS partition.
P*x*	Creates space for a DOS partition on volume SYS: (x = partition size in megabytes). Size range: 0 to 32 MB. Default: 5 MB.
R or R+	Assigns random passwords.
R-	Does not assign random passwords (default).

You can enter the parameters in any order. Parameters can be separated by either a slash (/), a minus sign (-), or a space.

For example, to run the upgrade as a batch process, create a 5MB DOS partition, and assign random passwords, type

```
LOAD A:2XUPGRDE /B /P5 /R+ <Enter>
```

When the "Final Status" screen appears ("Final Status screen" on page 265), continue with Step 9.

4 To proceed with the upgrade, type "Y."

WARNING: If the procedure runs correctly (that is, if there are no power failures or power surges, etc.), you do not need to restore your disk from the backup.

However, if a failure occurs, you may need to restore your disk to its previous condition.

"In-Place Upgrade Phases" on page 259 explains the In-Place Upgrade phases.

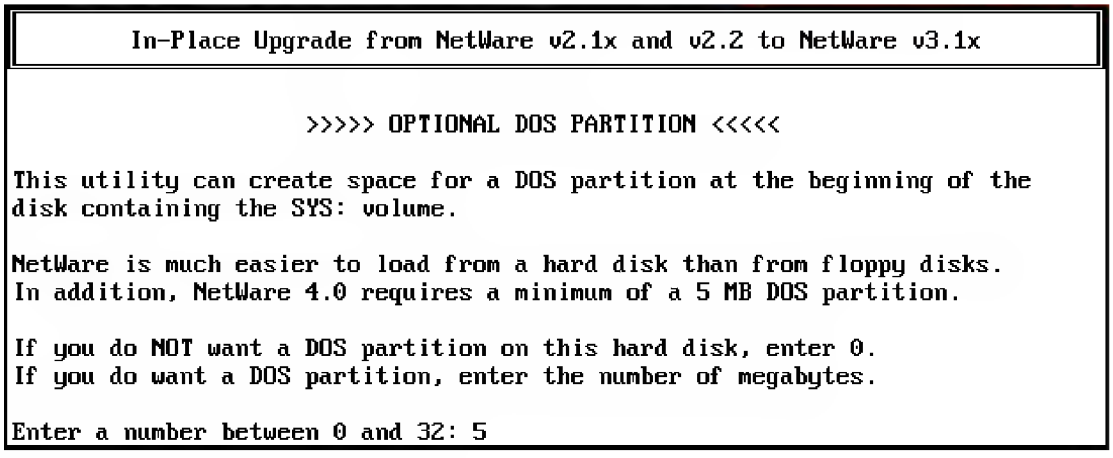
Table 26 In-Place Upgrade Phases

Phase	Description
1 System Analysis	Inventories each disk and each volume. Also ensures that the system has enough memory to successfully complete the upgrade.

Phase	Description
2 Disk Analysis	Analyzes each disk. An image of the new NetWare v3.12 disk is built and stored into memory. This phase is non-destructive and does not damage the existing NetWare v2.1x or v2.2 file system.
3 Disk Modification	Writes the new NetWare v3.12 file system to the disk, destroying the NetWare v2.1x or v2.2 file system. A hardware failure during this phase results in the irrecoverable loss of data on the server.
4 Bindery	Updates bindery objects, properties, and values such as user accounts and passwords. In NetWare v2.1x, these were included in two files in SYS:SYSTEM: NET$BIND.SYS (for objects and properties) NET$BVAL.SYS (for property data sets) Random user passwords are assigned if requested.

5 The DOS partition screen ("DOS partition screen" on page 260) appears.

Figure 72 DOS partition screen



At the prompt, enter the number of megabytes you want for the DOS partition and press <Enter>.

NOTE: The In-Place Upgrade can create the space (between 0 and 32 MB) for a DOS partition on the disk that contains volume SYS:. We recommend a DOS partition of at least 5 MB.

Booting the server from a DOS partition is significantly faster than booting from a diskette.

The "0" option is available for servers that boot from a diskette rather than from a DOS partition.

If you use a DOS boot diskette, refer to the procedures under "Install Server Software for Use with a DOS Boot Diskette" on page 35.

If there is not enough space on your disk to create a DOS partition, the upgrade stops and displays the following:

```
This NetWare server has insufficient free hard
disk space to complete the upgrade. The In-Place
Upgrade process is now being aborted.
```

NOTE: Reboot the NetWare v2.1x file server, and then restart the upgrade. Delete unnecessary files to free more space on the disk.

After you create the DOS partition, the following screens appear.

"System Analysis screen" on page 261 details the System Analysis phase where each disk is scanned and inventoried.

Figure 73 System Analysis screen

```
        In-Place Upgrade from NetWare v2.1x and v2.2 to NetWare v3.1x

                    >>>>> PHASE #1: SYSTEM ANALYSIS <<<<<

Scanning all disks for NetWare v2.1x and v2.2 volumes:

   Disk #0  (21000)     (CDC WrenIII/Embedded SCSI)
      Volume SYS:
      Volume VOL1:

This server has 12.7 MB of memory.
This upgrade will require approximately 10.2 MB of server memory.

<Press ESC to terminate or any key to continue>
```

"Disk Analysis screen 1" on page 262 details the first portion of the Disk Analysis phase.

This screen only appears if multiple disks are being upgraded.

These extra phases are run to determine how much server memory and free disk space is required per volume to successfully complete the upgrade.

Figure 74 Disk Analysis screen 1

```
        In-Place Upgrade from NetWare v2.1x and v2.2 to NetWare v3.11

                      >>>>> PHASE #2: DISK ANALYSIS <<<<<

The system is now being analyzed to ensure that it has enough memory and free
disk space to successfully complete the upgrade process.  High capacity disks
and disks with lots of directories may require more server memory to upgrade.

Analyzing Disk #0
Creating list of disk blocks to be moved . . . COPMLETE
Creating list of Hot Fix Redirection Area blocks to be moved . . . COMPLETE
Translating the Directory Entry Table (DET) for volume SYS: . . . COMPLETE
Translating the File Allocation Table (FAT) for volume SYS: . . . COMPLETE
Translating the Directory Entry Table (DET) for volume VOL1: . . . COMPLETE
Translating the File Allocation Table (FAT) for volume VOL1: . . . COMPLETE
Creating the Volume Segment Table . . . COMPLETE
```

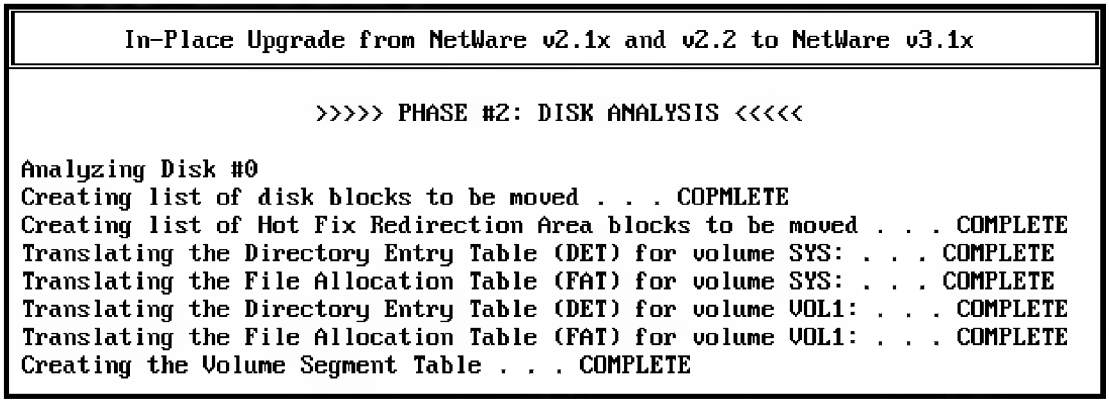
Servers with only one hard disk proceed directly to the second part of the Disk Analysis phase. See Figure 7-4.

The calculations made during the first part of the Disk Analysis phase are discarded to conserve server memory.

As shown in "Disk Analysis screen 2" on page 263 the Disk Analysis phase analyzes each disk. An image of the new NetWare v3.12 disk is built and stored in memory.

This phase is nondestructive and will not damage the existing NetWare v2.1x file system.

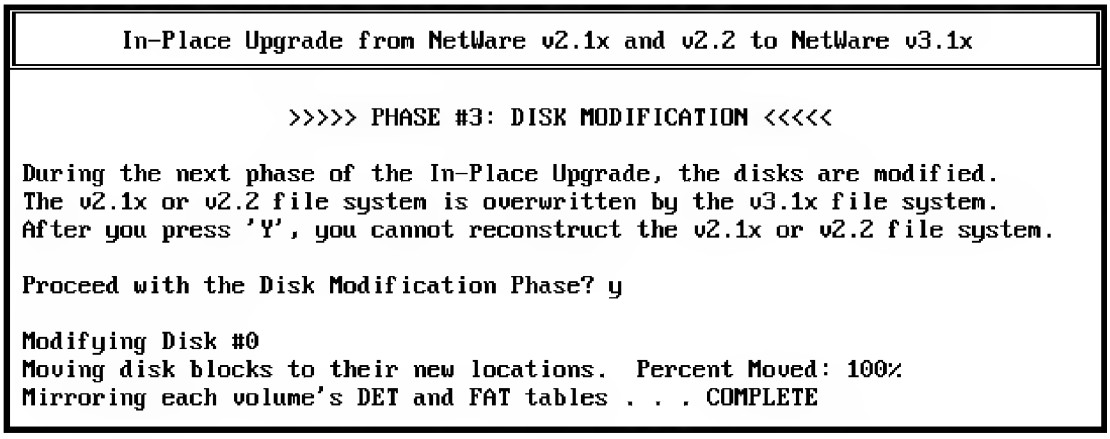
Figure 75 Disk Analysis screen 2



"Disk Modification screen" on page 263 details the Disk Modification phase. In this phase, the NetWare v2.1x file system is overwritten by the v3.12 file system.

The Disk Modification phase is the only destructive phase of the upgrade. This phase must be completed before NetWare v3.12 can use the disk.

Figure 76 Disk Modification screen



6 At the Disk Modification screen, type "Y" to continue with the upgrade or type "N" to quit.

NOTE: If you have multiple disks, the Disk Analysis and Disk Modification process repeats itself.

After all disks have been upgraded, volume SYS: is mounted and the bindery is upgraded. The NetWare v2.1x bindery is merged into the newly created v3.12 bindery.

The Bindery phase updates bindery objects, properties, and values such as user accounts and passwords.

Figure 77 Bindery screen

```
        In-Place Upgrade from NetWare v2.1x and v2.2 to NetWare v3.1x

                        >>>>> PHASE #4: BINDERY <<<<<

Mounting volume SYS
Initializing Transaction Tracking System

The In-Place Upgrade does not transfer user passwords to the v3.1x bindery.
You can choose to either leave users without passwords, or to assign
a random password to each user.  The SUPERVISOR will not be given a random
password.  Random passwords are recorded in the file NEW.PWD in the
SYS:SYSTEM directory.

Assign random passwords to users? y

Upgrading the bindery information . . . COMPLETE

Dismounting volume SYS
```

7 (Conditional) In the process of assigning passwords, if you did not use the [R+] or [R-] or [B] parameters when you started the upgrade, you are prompted to assign random passwords.

See Step 8 for password options.

8 Choose one of the following password options:

Password Option	Description
Y (assign random passwords)	A random password for each user who originally had a password is created by the utility and stored in a file called NEW.PWD. User SUPERVISOR is not assigned a password. Only the network supervisor has access to this file. Users cannot log in until the supervisor gives them their password from this list.
N (assign no passwords)	Users are not prompted for a password when they first log in. However, after they have logged in once, and if their accounts are set to require passwords, they are prompted to type a new password.

The Final Status screen displays how your disks and volumes were affected by the upgrade. See "Final Status screen" on page 265for an example.

Figure 78 Final Status screen

```
        In-Place Upgrade from NetWare v2.1x and v2.2 to NetWare v3.1x

  ***** The In-Place Upgrade to the v3.1x File System is now complete *****

  DISKS     VOLUMES                 STATUS MESSAGES

  Disk 0    SYS:                    Disk successfully upgraded.
            VOL1:

  Optional DOS Partition Size:  5 MB

  Random Passwords Assigned?  YES  (stored in SYS:SYSTEM\NEW.PWD)

<Press ESC to terminate or any key to continue>
```

The NetWare v2.1x file system has been upgraded to a v3.12 file system.

9 Press any key to receive further instructions and then return to the console prompt (:).

Mount Volumes

Procedure

1 Mount volume SYS: and other volumes by typing

```
MOUNT ALL <Enter>
```

2 Temporarily prevent users from logging in by typing

```
DISABLE LOGIN <Enter>
```

This prevents users from logging in as SUPERVISOR.

To allow users to log in when the upgrade is completed, type

```
ENABLE LOGIN <Enter>
```

Load LAN Drivers

Procedure

1 Insert the *System_2* diskette in drive A:.

2 Load the appropriate LAN drivers by typing

```
LOAD A:LAN_driver <Enter>
```

See Table 7-2 for a list of Novell LAN drivers.

The default frame type for NetWare v3.12 is Ethernet 802.2. To user the Ethernet 802.3 frame type, used in NetWare v3.11 and earlier, add "frame=Ethernet_802.3" when loading the LAN driver.

For example, type

```
LOAD A:NE2000 frame=Ethernet_802.3 <Enter>
```

3 Bind LAN drivers to the server's registered protocol.

For example, to bind IPX to the NE2000 LAN driver, type

```
BIND IPX TO NE2000
```

Enter the network number for your cabling system. To bind the Ethernet 802.3 frame type to the LAN_driver, add "frame=Ethernet_802.3" when binding the protocol.

For example, type

```
BIND IPX to NE2000 frame=Ethernet_802.3 <Enter>
```

Copy SYSTEM and PUBLIC Files

Procedure

1. Insert the *System_1* diskette in drive A:.
2. Load INSTALL.NLM by typing

   ```
   LOAD A:INSTALL <Enter>
   ```

3. Choose "System Options" and press <Enter>.
4. From the "Available System Options" menu, choose "Copy System and Public Files" and press <Enter>.
5. Insert diskettes as prompted.

Create a STARTUP.NCF File

A STARTUP.NCF file contains commands to load the disk drivers and name space support for your file server.

This file is executed after SERVER.EXE and is stored on the disk you boot from (hard disk or diskette).

Once this file loads the disk drivers and name space support, and mounts volume SYS:, it turns control over to AUTOEXEC.NCF to complete the boot process.

Procedure

1. Insert the writeable *System_1* diskette into drive A:.
2. Select "Create STARTUP.NCF File" from the "Available System Options" menu.
3. Enter the proper drive letter on the "Path For STARTUP.NCF File" screen.

   Use <Backspace> to make sure the drive is set to

   - C: to boot from hard disk.
   - A: to boot from drive A:. (This file can be copied to drive C: later.)

4 Press <Enter>.

A screen similar to the following appears:

Figure 79 A sample STARTUP.NCF file

```
LOAD ISADISK port=1f0 int=E
LOAD DCB PORT=340 INT=B
LOAD DCB PORT=348 INT=C
LOAD MAC
```

The operating system reads the information you previously entered for disk drivers and name space support.

5 From the following table, determine your system configuration and decide which additional commands you would like added to the STARTUP.NCF file.

To	Add these or other commands
Load name spaces for Macintosh, OS/2, UNIX, or FTAM	LOAD MAC.NAM LOAD OS2.NAM LOAD NFS.NAM LOAD FTAM.NAM (These commands must precede the command to mount the volume that stores the files using the name space.)
Set server parameters	(You can add the following eight commands to the STARTUP.NCF file only. You can add other SET commands to the STARTUP.NCF and to the AUTOEXEC.NCF file.) SET Maximum Physical Receive Packet Size SET Cache Buffer Size SET Reserved Buffers Below 16 Meg SET Maximum Subdirectory Tree Depth SET Concurrent Remirror Requests SET Auto TTS Backout Flag SET Minimum Packet Receive Buffers (For more on these and other SET parameters, see "SET" in *Utilities Reference*, or type "SET" at the server console.)
Pause after each command	PAUSE

6 Type one command per line.

7 Press <Esc> to save the file.

Create an AUTOEXEC.NCF File

An AUTOEXEC.NCF file contains commands to complete the boot process after SERVER.EXE and STARTUP.NCF executes.

Because AUTOEXEC.NCF is saved in and runs from SYS:SYSTEM, place most boot commands (except the disk driver and name space support commands) in AUTOEXEC.NCF.

Commands you can use in AUTOEXEC.NCF do the following:

- Name the file server.
- Assign the internal network number for the file server.
- Load LAN drivers for the file server and assign the network number.
- Bind LAN drivers to the file server's registered protocol.
- Load other modules you want loaded when the file server boots. (See "LOAD" in *System Administration*.)
- Execute other console commands (such as TRACK ON or VOLUMES) during the boot process.
- Set other parameters for the file server. (See "SET" in *System Administration*.)
- Mount volumes.

Procedure

1 From the "Available System Options" menu, select "Create AUTOEXEC.NCF File."

The operating system gathers information you have previously entered at the console prompt for this file.

A screen similar to the following appears, showing the commands that are automatically placed in AUTOEXEC.NCF.

Figure 80 A sample AUTOEXEC.NCF file

```
file server name SPEEDY
ipx internal net 1993ABCD
LOAD NE1000 port=300 int=3
bind IPX to NE1000 net=DEADBEAF
mount all
```

NOTE: When using the 802.3 frame type, rather than the 802.2 default, the screen shown above displays the frame type number.

If you load multiple LAN drivers, your AUTOEXEC.NCF file is different. See "INSTALL" in *System Administration*.

2 (Optional) From the table below, decide which loadable modules to load with AUTOEXEC.NCF.

To	Add these modules
Create disk partitions, create volumes, format a hard disk, etc.	LOAD INSTALL
Lock the file server console, view network operation information.	LOAD MONITOR
Load the print server on the file server and establish print services.	LOAD PSERVER *finance_print*
Correct volume problems or remove name space entries from File Allocation and directory tables.	LOAD VREPAIR

To delete or modify commands, backspace to erase the command.

3 (Optional) From your system configuration, determine additional loadable modules to include in AUTOEXEC.NCF.

Additional module types are shown in the table below.

Module Type	Module Name
Equipment	UPS.NLM
Remote Console	REMOTE.NLM RSPX.NLM
Remote Boot for token ring	TOKENRPL.NLM
Remote boot for IBM and Western Digital on Ethernet	ETHERRPL.NLM
Third-party loadable modules	(See third-party documentation)

NOTE: If you use an uninterruptible power supply, see "UPS" in *System Administration* for troubleshooting tips.

Some loadable modules need other loadable modules to function. If the prerequisite module is not loaded first, the operating system will look at your

default drive and then at SYS:SYSTEM and automatically load the necessary module.

4 From the table below, decide if you want any of the following console commands to execute with the AUTOEXEC.NCF file.

To	Add these console commands
Implement security measures	SECURE CONSOLE
Display the processor speed	SPEED

5 Decide from the table below additional commands you would like added to AUTOEXEC.NCF.

To	Add these or other commands
Mount Volumes.	MOUNT VOL1 (or other volume name) MOUNT ALL *Note:* Volume SYS: is mounted automatically when its corresponding disk driver is loaded during the STARTUP.NCF file's execution.
Bind protocols other than IPX to the LAN drivers.	BIND IP to...
Set server parameters.	SET commands (see "SET" in *Utilities Reference*.)
Pause after each command.	PAUSE

6 (Optional) Allow unencrypted passwords.

Use the table on the next page to help you decide whether to use unencrypted passwords on a network using encrypted passwords.

For	Use
A new installation with one file server on the network.	Encrypted passwords.
Upgrading from NetWare v2.x operating system.	Encrypted passwords temporarily.
A NetWare v3.12 file server running on the same network as NetWare v2.11 or earlier.	Encrypted passwords permanently.

For	Use
A NetWare v3.12 file server running on the same network as NetWare v2.11 or v2.15.	Encrypted passwords. Use SET in AUTOEXEC.NCF until utilities on other file servers are upgraded. Copy NetWare v3.12 utilities to all NetWare v2.12 or v2.15 file servers to allow all servers to use encrypted passwords. (See Utilities Reference.)

Type the following command at the console prompt to allow unencrypted passwords:

```
SET ALLOW UNENCRYPTED PASSWORDS=ON <Enter>
```

For more information on AUTOEXEC.NCF files or on the commands listed above, see System Administration. See also "Boot Files" in *Concepts*.

7 Press <Esc> to save the file.

8 Press <Esc> twice to exit INSTALL.

Format the DOS Partition

Procedure

1 At the console prompt (:), down the server by typing

```
DOWN <Enter>
```

2 Insert the *INSTALL* diskette in drive A:.

3 Return to the DOS prompt by typing

```
EXIT <Enter>
```

4 From the downed server, create a DOS primary partition and make it the active partition by typing

```
FDISK <Enter>
```

NOTE: The two utilities used to partition and format the DOS partition are found on the bootable *INSTALL* diskette. These DR DOS files, FDISK.COM and FORMAT.COM, also ship with NetWare v3.12.

FDISK is a DOS utility that creates or deletes DOS partitions on your hard disk. It can also select which partition is active. The DOS partition is placed on the first few cylinders of the hard disk. The server reboots DOS as part of the FDISK process.

5 Format the new DOS partition.

If you are using DR DOS, the format command is as follows:

```
FORMAT C:/s/x <Enter>
```

The /s parameter makes the partition bootable.

The /x parameter tells DR DOS that it is formatting a hard drive.

NOTE: If you are using DR DOS to format your hard drive, use FORMAT.COM on the *INSTALL* diskette or a later version.

If you are not using DR DOS, type the format command as follows:

```
FORMAT C:/s <Enter>
```

6 Reboot the server to make sure that DOS boots from the hard disk.

Copy the New Boot Files to a Boot Directory

Procedure

1 Create a boot directory.

For example:

```
C:\SERVER.312
```

The boot files are copied to this directory on drive C:.

2 Copy the newly created STARTUP.NCF file from the *System_1* diskette to the boot directory by typing

```
COPY A:\STARTUP.NCF C:\Boot_directory <Enter>
```

3 Change to the A: drive by typing

```
A: <Enter>
```

4 Insert the NetWare v3.12 *Install* diskette into drive A:, and type

```
A:NWNSTLL /IN_PLACE <Enter>
```

The "Select an Installation Option" menu appears.

5 Choose "Upgrade NetWare v3.1x or v4.x."

The "Copy Files to the DOS Partition" screen appears.

6 Specify the destination directory (where you want the boot files to be copied).

7 Copy the NetWare v3.12 server boot files to the boot directory.

7a Press <F4>.

The "Enter the destination path" screen appears.

7b Enter the destination path created in Step 1 for the files to be copied.

This should be the same directory that the STARTUP.NCF was copied to in Step 2.

To	Then
Change the source drive.	Press <F2> and enter a new drive letter or directory, and then press <Enter>.
Change the destination directory on drive C:.	Press <F4>, enter a directory name, choose "Yes," and then press <Enter>.

The following files are copied to the newly-created boot directory on drive C: (or another directory on C: that you specify.)

- SERVER.EXE (the NetWare operating system).
- NUT.NLM (an interface utility needed for certain NetWare Loadable Modules).
- NWSNUT.NLM (an interface utility needed for certain NetWare Loadable Modules).
- Disk drivers (*.DSK).
- Name space modules (*.NAM).
- CLIB.NLM (C runtime library).
- Diagnostic NLMs (*.NLM).
- INSTALL.NLM (the installation utility).
- LAN drivers (*.LAN).
- Message and help files.

7c If the directory you specified in Step 7b does not exist, the following message appears:

```
Do you want to create "directory name." Y/N
```

NOTE: If you use a third-party driver not shipped in the red box, you may need to exit INSTALL and copy the disk driver (*.DSK) to the new boot directory.

7d If you choose "Yes," press <Enter> to create the new directory.

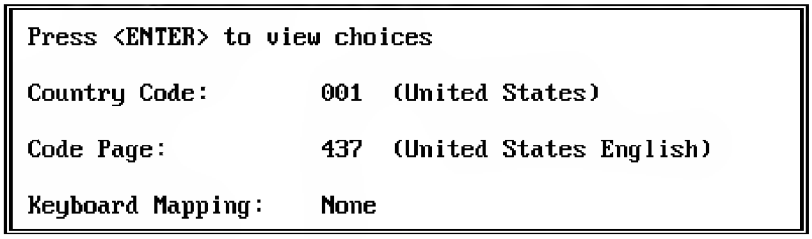
7e Copy your STARTUP.NCF file into the new directory if it is different than the directory created in Step 1.

7f Press <Enter> to continue.

7g Insert the diskettes as prompted.

Once the files have been copied, the following screen appears:

Figure 81 Locale configuration screen



8 Enter your Country Code, Code Page, and Keyboard Mapping setting and press <F10>.

NOTE: For a list of settings for each field, highlight a field and press <Enter>, or refer to your DOS manual.

The keyboard mapping command is automatically added to the STARTUP.NCF file.

The following screen appears.

Figure 82 Select a format

9 Select a format for your DOS files and press <Enter>.

Selecting "NetWare Filename Format" leaves previously-saved DOS files with non-standard DOS characters as they were.

The upgrade is complete.

10 From the boot directory, load the server operating system by typing

```
SERVER <Enter>
```

11 Complete the steps under "What toDo After the Upgrade" on page 282.

NetWare v3.x to v3.12 Upgrade

What this Procedure Does

- Copies new NetWare v3.12 files onto the DOS partition on the NetWare v3.1x server's hard disk.

  This includes SYSTEM and PUBLIC files, SERVER.EXE, disk and LAN drivers, name space support modules, and other loadable modules.

- Scans the server configuration files (STARTUP.NCF and AUTOEXEC.NCF) to make sure information gets updated (especially Ethernet driver frame types).

How NetWare Name Service Servers Get Upgraded

If you are upgrading a NetWare v3.11 serving running NetWare Name Service (NNS), we strongly recommend upgrading all v3.11 servers in a domain at the same time.

IMPORTANT: Do not log in to the upgrade server until the NNS files have been reinstalled.

Necessary Resources

- Minimum of 4MB RAM on the server.
- Minimum of 25 MB free space on volume SYS:.
- A NetWare v3.0 or v3.11 server with all volumes mounted. This upgrade program upgrades binderies only for mounted volumes.
- Working copies of the NetWare v3.12 diskettes. For an installation from a network directory, a drive mapped to the working areas where copies of the diskette files are located.

Prerequisites

- (Optional) Use the NetWare v3.1x SALVAGE utility to restore deleted files.

  To salvage already-deleted files, restore them before upgrading.

  As you mount existing volumes under NetWare v3.12 version of NetWare, purged files are eliminated and appear on the FILER utility screen as eliminated files.

- Make sure you have a fully functional backup of your NetWare v3.x system. Do not attempt an upgrade without one.

- Notify users to log out of the NetWare v3.x server.

  Broadcast a message from the console (using the BROADCAST command) that users must log out before the server upgrade. Users (this includes print servers) must stay logged out until the upgrade is complete.

- If you are using third-party NLMs, disk drivers (*.DSK), or LAN drivers (*.LAN), check with your Novell Authorized Reseller for compatibility issues before upgrading your network.

  Most third-party disk and LAN drivers written for NetWare v3.1x work with v3.12.

Start the Upgrade to NetWare v3.12

Procedure

1. Load v3.1x INSTALL.NLM and edit the AUTOEXEC.NCF file with respect to frame types.

   NetWare v3.12 accepts 802.2 and 802.3 frame types. The default for NetWare v3.12 is 802.2.

   WARNING: For Ethernet networks, we recommend that you load both frame types, or that your frame type be set at 802.3 until all file servers and workstations are upgraded to v3.12.

2. Down the server.

   At the system console (:), type

   DOWN <Enter>

3. Exit to DOS by typing

   EXIT <Enter>

4 Copy all old boot files to another diskette or directory.

Take this precautionary measure to ensure that you have a backup of your old boot files.

Boot files include:

*BAT
*.DSK (disk drivers)
INSTALL.NLM
*.LAN (LAN drivers)
*.NAM (name spaces)
SERVER.EXE
STARTUP.NCF
VREPAIR
AUTOEXEC.NCF

Complete the Upgrade to NetWare v3.12 Using INSTALL.NLM

Procedure

1 Insert the NetWare v3.12 INSTALL diskette into drive A: and type

```
INSTALL <Enter>
```

2 Choose "Update NetWare v3.1x to v3.12.

The "Copy Files to the DOS Partition" screen appears. You must specify the destination directory (where you want SERVER.EXE, etc. to be copied).

3 Copy the new NetWare v3.12 server boot files to the boot directory.

3a Press <F4>.

The "Enter the destination path" screen appears.

3b Enter the destination path for the files to be copied.

To	Then
Change the source drive.	Press <F2> and enter a new drive letter or directory, and then press <Enter>.
Change the destination directory on drive C:	Press <F4>, enter a directory name, choose "Yes," and then press <Enter>.

For example:

```
C:\SERVER.312
```

The files are copied from the Install diskette to the destination directory on drive C:.

The following files are copied to the newly-created boot directory, on drive C: (or another directory on C: that you specify.

- Standard disk drivers (*.DSK)
- INSTALL.NLM (the installation utility)
- Message and help files
- NWSNUT.NLM (an interface utility needed for certain NetWare Loadable Modules)
- LAN drivers (*.LAN)
- SERVER.EXE (the NetWare operating system)

If you enter a directory other than your original NetWare v3.1x directory (such as SERVER.312), complete Step 3c and Step 3d.

3c If the directory that you specified in Step 3b does not exist, the following message appears:

```
Do you want to create the directory "directory name." Y/N
```

NOTE: If you are using a third-party driver not shipped in the red box, you may need to exit the INSTALL and copy the disk driver (*.DSK) to the new boot directory.

3d If you choose "Yes," press <Enter> to create the new directory. The following message appears:

```
Enter the path to your existing SERVER.EXE
file.
```

3e Type the path to your existing SERVER.EXE file.

4 After you set the destination path, insert the diskettes as prompted.

Once the appropriate files have been copied, the following message appears:

```
OK to invoke existing STARTUP.NCF file?
```

If you choose	Then
Yes	The existing STARTUP.NCF file is invoked in the directory specified in Step 3
No	A new STARTUP.NCF file is created in your new boot directory.

NOTE: Your decision whether to invoke the existing STARTUP.NCF file or create a new one will determine whether you will use your existing STARTUP.NCF file or create a new AUTOEXEC.NCF file as well.

Once the files have been copied, the following screen appears:

Figure 83 Locale configuration screen

```
Press <ENTER> to view choices

Country Code:        001  (United States)

Code Page:           437  (United States English)

Keyboard Mapping:    None
```

5 Enter your Country Code, Code Page, and Keyboard Mapping setting and press <F10>.

NOTE: For a list of settings for each field, highlight a field and press <Enter> or refer to your DOS manual.

The following screen appears.

Figure 84 Select a format

6 Select the desired format for your DOS files and press <Enter>.

Selecting "NetWare Filename Format" leaves previously-saved DOS files with non-standard DOS characters are they are.

Selecting "DOS Filename Format" replaces all non-standard DOS characters with standard DOS characters.

NOTE: If you select "DOS Filename Format," and your selection in Step 8 is unchanged, press <F9> to view what character changes will be made.

You are asked if you want to specify any startup SET commands.

7 Select "Yes" or "No."

Selecting "Yes" brings up a blank screen for entering the special startup commands. Use this screen mainly for changing the default setting of SET AUTO REGISTER MEMORY to OFF.

Turning off SET AUTO REGISTER MEMORY allows you to load disk drivers that can't be loaded in the memory area above 16 MB.

NOTE: Changing the SET AUTO REGISTER MEMORY setting to OFF disables all memory above 16MB. For optimal use of RAM, install a disk driver that can be loaded in the memory area above 16MB.

The documentation that accompanied your disk driver will indicate the RAM required for loading.

8 Press <F10> to save the startup commands.

9 Copy the NetWare v3.1x STARTUP.NCF file into the boot directory.

The STARTUP.NCF file resides in the boot directory of your NetWare v3.1x server and contains commands to load the disk driver and to mount volume SYS:.

INSTALL copies the old v3.1x STARTUP.NCF file into the boot directory to ensure that the server will boot like it used to.

10 Press <Alt><Esc> to get to the system console screen.

You are prompted for the file server name.

11 Enter the file server name and press <Enter>.

HINT: To avoid changing the server name in all login scripts, leave the server name the same as the existing v3.11 server name.

You are prompted for the IPX internal network number.

12 Type the IPX internal network number and press <Enter>.

13 If you decided in Step 4 to create a new STARTUP.NCF file, continue with Step 14. If you decided to invoke the existing STARTUP.NCF file, skip to Step 19.

14 Load your disk driver by typing

```
LOAD disk driver <Enter>
```

15 Load your LAN driver by typing

```
LOAD LAN driver <Enter>
```

16 (Conditional) Define the I/O port number by accepting the default number shown on the screen, or by selecting a new one.

17 (Conditional) Define the interrupt number by accepting the default number shown on the screen, or by selecting a new one.

18 Mount volume SYS: and other defined volumes by typing

```
MOUNT ALL <Enter>
```

19 Press <Alt><Esc> to get to the "System Install" screen.

20 Select "System Options" and press <Enter>.

The "Available System Options" menu appears.

21 Select "Copy System and Public Files" and press <Enter>.

22 Insert the diskettes as prompted.

23 (Conditional) If you are performing a same-server migration, go to Step 24.

24 Read "What to Do After the Upgrade" "What toDo After the Upgrade" on page 282.

What toDo After the Upgrade

Complete the following steps before allowing users to log in.

Procedure

1. ChangeSUPERVISOR password.

   Log in from a workstation as SUPERVISOR. Change the password using either SETPASS or SYSCON.

2. Change user passwords.

   If you chose to assign random passwords, print the NEW.PWD file and distribute the password information to each user. Users should change their passwords immediately, using either SETPASS or SYSCON.

3. Check applications to see if they run properly.

   Some DOS applications don't work when installed on volumes that have more than 32 MB of disk space. Some of these applications can be made to work by doing the following:

   - Restrict the application's directory on the destination server with DSPACE.
   - Make the directory path a fake root using the MAP command.

4. Check directory security.

   Check directory security if you used either of the following items for NetWare v2.1x security:

   - Maximum Rights Mask
   - Private attribute

5. Set new directory and file attributes using FLAG or FILER.

   For a list of directory and file attributes, see "Evolution of file attributes" on page 204 through "Evolution of directory attributes" on page 207 in Chapter 5.

6. Check directories for unnecessary NetWare files.

   *NetWare v2.1*x

   The following NetWare v2.1x files are not compatible with NetWare v3.12 and should be deleted.

   VAP files (*.VAP, *.HLD, *.VP?)
   LARCHIVE.EXE

LRESTORE.EXE
MACBACK.EXE
NARCHIVE.EXE
NRESTORE.EXE
NET$BIND.SYS
NET$BVAL.SYS
NET$BIND.OLD
NET$BVAL.OLD
NET$ERR.SYS
NET$OS.EXE
NET$DOS.SYS
NET$MSG.SYS
NET$REC.DAT

HIDEFILE.EXE and SHOWFILE.EXE still work but have not been included in NetWare v3.x.

These files were copied into SYS:SYSTEM. You can either delete them (FLAG allows users to add and remove System and Hidden attributes from files) or leave them.

NetWare v2.0a

The following NetWare v2.0a files are not compatible with NetWare v3.x. They should be deleted.

ENDSPOOL.EXE
Q.EXE
QUEUE.EXE
SPOOL.EXE

The utilities listed above are replaced by ENDCAP, PCONSOLE, and CAPTURE in NetWare v3.12. For more information, see Utilities Reference.

7 Modify the system and user login scripts.

Update references to the server in the system and user login scripts if you changed the server name.

Although user login scripts are upgraded, they are not modified and server names are not changed to match your new environment. Use SYSCON to modify the login scripts.

With NetWare v2.x, you could give users drive mappings to directories in which they had not been granted rights. NetWare v3.12 will not allow users to have drive mappings to directories in which they have not been assigned rights.

If you have set up your login scripts so that users have drive mappings to directories in which they have no rights, these users receive the following message when they log in:

```
Attempt to map drive to invalid path in MAP
command.
```

Complete one of the following:

- Delete the drive mapping from the login script.
- Delete the drive mapping from the system login script and insert the drive mapping in the user login scripts only when the user has been granted rights to the directory.
- Create a group, grant the group the trustee assignment, assign the appropriate users to the group, and then use an IF... THEN command in the system login script before the drive mapping (IF member of "*groupname*," THEN map p:=*volume:directory*).

8 Create new boot diskettes for each workstation.

All users on the NetWare v3.x file server need to boot with the new shell and IPX files before they log in.

8a If the server was renamed, change the file server's name in the users' AUTOEXEC.BAT files to the new v3.12 file server name.

8b If you have other NetWare v2.x file servers on your network, upgrade the workstation files for those users even if you aren't upgrading the file server.

The new workstation files shipped with NetWare v3.12 are compatible with NetWare v2.x. All users on the internetwork should use the latest version of the workstation files to ensure that there are not conflicts.

9 (Conditional) Copy the NetWare v3.12 utilities to other file servers on the network.

The NetWare v3.x public utilities will run on file servers running NetWare v2.x. Complete one of the following:

- If you have file servers running v2.0a, v2.10, or v2.11, do not copy the NetWare v3.x public utilities to them. However, copy the NetWare v3.x LOGIN.EXE file to the SYS:LOGIN and SYS:PUBLIC directories.
- If you have NetWare v2.12 or v2.15 file servers on your network, replace the NetWare public utilities with the NetWare v3.x public utilities to allow the v2.12 and v2.15 file servers to work with encrypted passwords.

To copy utilities, complete the following steps:

9a Log in to the NetWare v2.x file server as SUPERVISOR.

9b Flag the NetWare v2.x utilities Normal. In the SYS:LOGIN and SYS:PUBLIC directories, type

```
FLAG *.* N <Enter>
```

9c Protect the system login script. In the SYS:PUBLIC directory, type

```
FLAG NET$LOG.DAT SRO <Enter>
```

9d Map a drive to the SYS:PUBLIC directory on the NetWare v3.12 file server by typing

```
MAP drive:=fileserver/SYS:PUBLIC <Enter>
```

Replace *drive* with a drive letter not being used and replace *fileserver* with the name of the NetWare v3.12 file server.

9e Enter your username and password for the NetWare v3.12 file server.

9f Copy the NetWare v3.12 PUBLIC files to the NetWare v2.x file server.

For example, if drive Q is mapped to SYS:PUBLIC on the NetWare v3.12 server and drive F is mapped to SYS:PUBLIC on the NetWare v2.x file server, change to drive F and type

```
NCOPY Q:*.* <Enter>
```

9g Flag the NetWare v3.12 utilities on the NetWare v2.x file server Shareable and Read Only. Type

```
FLAG *.* SRO <Enter>
```

9h Repeat Step 9e and Step 9f for the SYS:LOGIN directory.

IMPORTANT: Login scripts on the NetWare v3.12 file server do not execute properly unless you copy the NetWare v3.12 login programs to all NetWare LOGIN directories on your internetwork.

9i When you have copied the NetWare v3.12 utilities to all NetWare v2.1x file servers and you do not have any NetWare v2.0a file servers, you can change the setting for unencrypted passwords. At the console prompt of the NetWare v3.12 file server, type

```
SET ALLOW UNENCRYPTED PASSWORDS=OFF <Enter>
```

If you still have NetWare v2.0a file servers on your internetwork, the setting at the NetWare v3.12 file server for unencrypted passwords must be ON.

10 If your v2.x server had mirrored disks, remirror them using INSTALL.NLM.

11 Update as necessary upgraded print queues using PCONSOLE.

12 Use NBACKUP to make a backup copy of all data on the NetWare v3.12 server.

For NBACKUP instructions, see Utilities Reference.

13 Check user restrictions and accounting charge rates to make sure your system is configured the way you want it.

14 (Optional) If your network includes workstations that use an operating system that supports long filenames, make sure you have loaded the name space module, then use the ADD NAME SPACE command to add name space to the volume. Type

```
ADD NAME SPACE name-support TO VOLUME volume_name
<Enter>
```

For example, if you have a volume named MAC for Macintosh files, type the following at the console prompt:

```
ADD NAME SPACE MACINTOSH TO VOLUME MAC <Enter>
```

Use the command once for every volume that needs to store files with long names.

To ensure name space support each time the file server is brought up, load the appropriate name space module in the STARTUP.NCF file.

15 (Optional) To store Macintosh files and folders on a NetWare v3.12 server, install NetWare for Macintosh (a separate Novell product) on the v3.12 server.

This product provides support for Macintosh workstations that connect to the v3.12 server.

16 Allow users to log in to the NetWare v3.12 file server.

User can log in if

- Volume SYS: is mounted
- The user exists in the bindery
- The LAN driver is loaded and bound to a protocol
- Login is enabled

To ensure that login is enabled, type

```
ENABLE LOGIN <Enter>
```

A Optimizing Network Performance

Two concepts are vital to fine-tune a NetWare v3.12 file server to achieve optimized performance:

1. A NetWare v3.12 server is not a single device, but rather a collection of components and subsystems that directly or indirectly affect the performance of the entire network.
2. The NetWare v3.12 operating system is designed to be as self-tuning as possible.

This appendix briefly discusses server components and ways of optimizing them.

It also gives fine tuning tips, including guidelines on how to adjust NetWare v3.12 SET command parameters.

File server optimization is not an exact science and each file server configuration is unique.

For these reasons the tips and techniques described in this appendix may or may not prove effective for your network environment.

IMPORTANT: Do not proceed with this appendix until you have given your newly installed or upgraded server adequate time to tune itself.

IMPORTANT: You should not expect your server to be fully optimized immediately following installation or upgrade. NetWare v3.12 must be allowed to fully use the individual components that make up NetWare v3.12.

IMPORTANT: We also recommend that you not test your server for performance without first tuning the server for performance.

For more on the subjects covered in this appendix, see "Netware v3.11 Server Tuning and Optimization" in *NetWare Application Notes* 3(6):1-40 (June 1992).

Server Components

The principal NetWare v3.12 server components that can be modified for performance are

- *Memory*. NetWare is extremely memory-oriented and makes extensive use of caching.
- *The communications subsystem*. This is the server's LAN I/O channel.

  A number of areas can affect performance within this category: packet size, communication buffers, Packet Burst™ protocol, SAP traffic, and network boards.
- *The file system and cache*. NetWare's file system is very closely related to cache.
- *The system processor*. If all other server components are optimized, the ultimate bottleneck could be the system processor and bus.

Use NetWare v3.12 SET parameters to optimize these server components and, as a result, the network. Tuning these server components is explained in the following sections.

The NetWare v3.12 Memory Model

The memory model for NetWare v3.12 is based on the use of 32-bit registers, which enables NetWare to provide access to one flat segment of RAM up to 4 GB.

The entire NetWare environment—the operating system (OS), LAN and disk drivers, and NLMs—can be loaded into this RAM segment.

Memory Pools

Netware v3.12 manages RAM through the use of memory pools. These memory pools are designed to be allocated and optimized based on how they are used: either long-term or short-term.

Rather than allocating chunks of memory at the time of installation, most resources (such as memory for communication buffers and drive mappings) are allocated as needed.

Any values that must be preassigned are specified in the server's STARTUP.NCF and AUTOEXEC.NCF files.

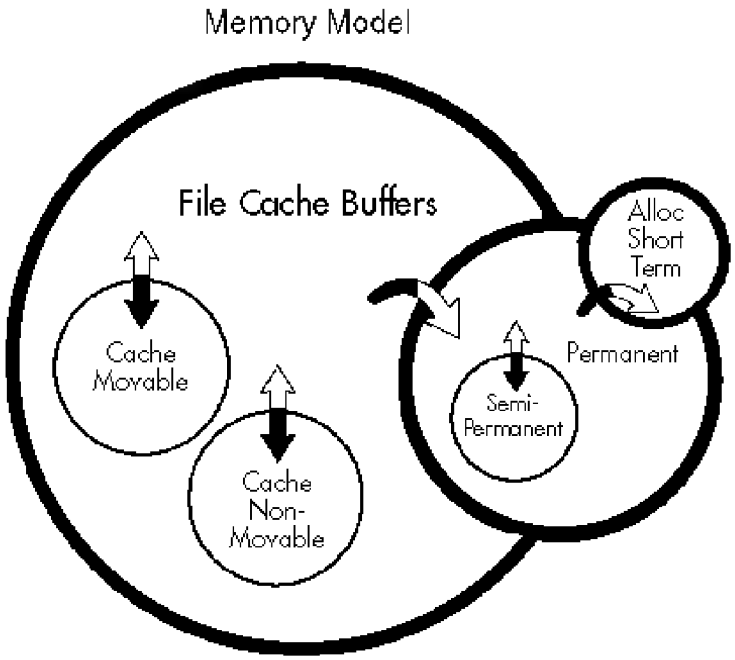
"Memory pools and subpools" on page 291 summarizes the memory pools and subpools created and maintained by NetWare v3.12.

Table 27 Memory pools and subpools

Memory Pool or Subpool	Description and Use	Status
File Cache Buffer	Main memory pool; used for caching reads and writes.	Primary memory segment.
Cache Movable	Subpool owned by NetWare; used for internal system tables that change size dynamically: Hash tables File allocation tables (FATs) Directory entry tables (DETs) No fragmentation. Expandable.	Returnable to File Cache Buffer in contiguous blocks.
Cache Non-Movable	Subpool used by NLMs, including CLIB, when loaded. Causes fragmentation. Non-expandable.	Returnable to File Cache Buffer in non-contiguous blocks.
Permanent Memory	One-way allocation pool for long- term memory needs: Communication buffers Directory cache buffers	Not returnable to File Cache Buffer.
Semi-Permanent	Subpool used by LAN and disk drivers.	Returnable to Permanent Memory, but not to File Cache Buffer.
Allocated Short-term Memory	Pool used for small, short-term allocations: Drive mappings SAP and RIP tables Queue manager tables User connection information	Not returnable to either Permanent Memory or to File Cache Buffer. Unused allocated memory remains in the pool for other uses.

"Relationship of memory pools" on page 292 illustrates the relationship of NetWare v3.12 memory pools.

Figure 85 Relationship of memory pools



Optimizing Memory Allocation

Once memory resources are released from the File Cache Buffer pool to the Permanent Memory pool or to the Allocated Short-term Memory pool, they cannot be returned until after the server is brought down and the primary memory segment is re-established.

Frequent loading and unloading of NLMs causes fragmentation of your file server's memory.

Although there may be plenty of *total* RAM to satisfy memory requests, there may not be enough *contiguous* RAM to actually service the requests.

There are two ways to optimize your file server's memory allocation:

- Minimize loading and unloading of NLMs to prevent RAM fragmentation.
- If the RAM becomes fragmented, bring down the server and start it back up. This eliminates fragmentation and makes contiguous memory available to NLMs.

Communications Subsystems

The following are communications subsystems that the NetWare installer or network supervisor can modify to tune the NetWare environment:

- *Burst Mode technology*. Technology that improves NetWare's performance when reading and writing large files over local and remote links.
- *Packet size*. The size of the frame or packet that a client and server communicate with.
- *Communication buffers*. The shared buffers available for incoming and outgoing packets, whose quantity will affect performance.
- *SAP traffic filtering*. Clients use SAP in their initial attachment to find the nearest server. Routers also use it to exchange server information.
- *Network boards*. The configuration flexibility of your network board, along with volume and makeup of the network traffic, could quickly cause saturation and create a bottleneck.

Burst Mode Technology

Burst Mode is a special-purpose service protocol designed to optimize large NetWare Core Protocol (NCP) reads and writes.

NCP is a communication protocol that uses IPX as a transport and controls the dialogue between client and server.

Burst Mode protocol allows a client to issue a single read or write request for blocks of data up to 64 KB. The data is partitioned into appropriate packets which are transmitted back-to-back.

Burst Mode Components

Two components necessary to implement Burst Mode are the PBURST.NLM for the server and a new shell (BNETX) for the client.

The server component, PBURST.NLM, becomes part of the operating system and provides an extended set of NCPs which are supported by the new client shell.

A number of Burst Mode buffers must be configured in the client's NET.CFG file to support the multi-packet reads and writes.

These buffers are the size of the maximum frame size supported. More RAM is required at the client to adequately support Burst Mode communication.

Burst Mode offers better performance in a variety of network environments. The following list names some environments that can benefit from Burst Mode:

- WANs with 9600-baud or slower asynchronous links
- Local network segments in which large files are read and written often
- Internetworks with multiple bridges and routers
- X.25 packet switching networks
- WANs with high-speed T1 and satellite links

Server Default Packet Size

The default packet receive buffer size for a NetWare v3.12 server is 1 KB (1024 bytes).

This is true even if the network board or LAN driver specified a packet size of 4 KB (as in token ring) and the hardware has been configured to handle 4KB packets.

The 1KB default setting could cause large packets to slow the server. Increasing the packet size default allows the server to move more information at a time, increasing the speed with which large jobs are sent.

Once the packet size default setting is increased, NetWare's Communication Buffers (also known as LSL Receive Buffers) increase in size automatically to accommodate the new default.

Modification of the packet size is achieved with a SET parameter in the STARTUP.NCF file:

```
SET MAXIMUM PHYSICAL RECEIVE PACKET SIZE =
```

Default: 1514

Range: 618 to 4202

The value for this parameter equals the size of the data portion plus the protocol overhead.

WARNING: When changing this parameter, be careful not to exceed the largest client packet size in use on the network.

The network board manufacturer's driver specifies the maximum packet size it can handle.

The default size for the NetWare DOS client shell is always 4 KB. However, the proposed packet size takes its reference point from the network board driver.

The following is a list of default packet sizes that can be used if a driver-specific size is unknown.

Drivers	Default packet size
Token-Ring 4 Mbps	2154 KB
Token-Ring 16 Mbps	4202 KB
Ethernet	1130 KB
Arcnet	618 KB

Packet Size through an Intermediate Router

Workstations connected to a file server through a router are limited to sending packets of 512 bytes.

To get around this limitation, use the Large Internet Packet support (LIP) NLM that is part of the Packet Burst technology.

Large Internet Packet

The LIP Internet Packet eXchange (IPX) allows the client and server to negotiate the largest available packet size and then use that size for communication through an intermediate router.

The server must contain PBURST.NLM. The workstation must contain the NETX.EXE v3.31 shell. Each is available in the NetWare v3.12 diskette set.

In addition to requiring NETX.EXE, two parameters must be configured in NET.CFG:

```
Large Internet Packets = 1 (on)LI Frame Max =
```

Default: 512

Range: 512 to 16384

Communication Buffers

Communication buffers are allocated dynamically, based on an aging algorithm in the OS.

A minimum number of buffers can be preallocated when the server boots, and a maximum number specified to prevent an out-of-control growth situation.

Communication Buffer SET Parameters

The network supervisor can control the increase in the number of communication buffers by using SET parameters in STARTUP.NCF and AUTOEXEC.NCF.

You can use two SET parameters to preconfigure or preallocate the number of buffers based on use. The first is the SET Minimum Packet Receive Buffers parameter:

```
SET MINIMUM PACKET RECEIVE BUFFERS =
```

Default: 10

Range: 10 to 1000

Using MONITOR, the network supervisor can compare the number of configured buffers to the number in use.

The second SET parameter controls the maximum number of buffers that can ever be allocated:

```
SET MAXIMUM PACKET RECEIVE BUFFERS =
```

Default: 100

Range: 50 to 2000

Occasional peaks in server use cause the number of buffers to grow significantly. This growth may need to be controlled because of impact on memory.

A third SET parameter controls the amount of time the system waits before spawning a new buffer:

```
SET NEW PACKET RECEIVE BUFFER WAIT TIME =
```

Default: 0.1 seconds

Range: 0.1 to 20 seconds

This parameter complements the SET Maximum Packet Receive Buffers parameter and functions as a growth inhibitor. The most common use is on networks with occasional spikes of activity.

WARNING: The network supervisor needs to be conscientious in configuring these parameters. While they provide great flexibility, they can also have a negative impact on memory.

The impact on overall system memory must be thoroughly understood, and the settings should be based on server performance over extended periods of time.

Service Advertising Protocol (SAP) Traffic

In NetWare, SAP is used by file servers, print servers, gateways, etc. to advertise their services.

Workstations use SAP in their initial attachment to find the nearest server. Routers also use it to exchange server information.

A single SAP packet is broadcast for every seven servers on the network. SAP packets are broadcast every 60 seconds on local segments and over high speed links.

Filtering SAP Traffic with NSAR

The NetWare Service Advertising Restrictor (NSAR) is a set of NLMs that allows masking or filtering of SAP packets to minimize the amount of broadcast traffic on the network.

These NLMs can be used as a route designator and to determine which servers are visible.

The main module, RESTRICT.NLM, lets the network supervisor review the services to be advertised and can then restrict certain entries from being made available on certain segments.

Network Board Issues

The configuration flexibility of your network board, along with volume and makeup of the network traffic, can quickly cause saturation and create a bottleneck.

NetWare's MONITOR utility provides two sets of statistics for every network board in the server.

The first set consists of general error entries.

All driver manufacturers are instructed to maintain information on 15 different statistics.

These include statistics such as total packets sent and received, packets dropped due to no available communication buffers, etc.

The second set consists of custom statistics. There are 15 to 20 additional statistics that vendors can provide.

One particularly helpful custom statistic for the Ethernet NE2000 card is "Enqueued Sends Count."

This indicates the number of packets that the network board had to buffer because the driver was too busy to send the packet that the processor had ready.

If this count increments regularly and reaches one to two percent of the total packets transmitted, the network board driver is having trouble keeping up with the server and is reaching or has reached its saturation point.

If the network board is an 8-bit or 16-bit card, you may need to replace it with a 32-bit card.

File System and Cache

Optimizing the NetWare caching mechanism includes adjusting parameters that affect NCP reads and writes, block and buffer size, FATs, and directory entry tables.

This section covers the following file system and cache subsystem areas:

- *File cache buffers*. Increasing the amount of cache optimizes the file system.
- *Cache buffer and volume block size*. Modifying the cache block size adds efficiency to the file server by increasing response time between server and client.
- *Turbo FAT indexing*. Increasing the Turbo FAT re-use wait time ensures that Turbo FAT index structures are not flushed if the file is reused quickly.
- *Directory entry table caching and name space considerations*. Adding name spaces at volume creation, and using separate volumes to divide files that require name spaces, can help optimize NetWare file system performance.

- *Additional SET parameters for file system and cache.* Additional SET parameters can optimize the file system and cache.
- *Disk drivers and controllers.* Using an intelligent controller provides support for scattering to help optimize disk I/O in a large network configuration.

File Cache Buffers

The amount of total server memory being used as cache buffers should never fall below 20 percent.

A good rule of thumb is that the File Cache Buffers pool should be at least 40 to 60 percent of the total server work memory. However, the higher this percentage, the better.

Additional memory not only benefits cache, but also adds to the memory available for the other pools that allocate from the main File Cache Buffer pool.

Cache Buffer Size and Volume Block Size

Modifying the cache block size in memory and the block size on the physical disk adds efficiency to the file server by increasing response time between server and client.

Cache buffer size is determined at server startup time by the following SET parameter:

```
SET CACHE BUFFER SIZE =
```

Default: 4096

Range: 4096, 8192, 16384

Volume block size is set for each volume when the volume is created. The default is 4 KB (4096 bytes).

The system is optimized when cache block size and volume block size are the same.

However, this is not always possible when you have multiple volumes on the server and they aren't all configured to use the same block size.

NetWare requires that the cache buffer size be the same as the smallest volume block size.

For optimal performance, Novell recommends that cache buffer size and volume block size be configured to 8 KB when using NetWare NFS.

Turbo FAT Indexing

The File Allocation Table (FAT) indexes one or more disk allocation blocks in which a file is located.

The entire FAT is cached in server memory, allowing the server to quickly access disk allocation blocks of data volume.

When a file exceeds 64 blocks, NetWare creates a Turbo FAT index that groups all FAT entries corresponding to the file.

When a file accessed through a Turbo FAT index is closed, the Turbo FAT index is not immediately flushed from memory. Rather, an aging process begins.

An existing index is only flushed and re-used when there is an allocation from the Permanent Memory pool and the aging timer has exceeded its default time of 5 minutes and 29.6 seconds.

This time can be altered through the following SET parameter:

SET TURBO FAT RE-USE WAIT TIME =

Default: 5 minutes 29.6 seconds

Range: 0.3 sec. to 1 hour, 5 minutes, 54.6 seconds

Increasing the Turbo FAT re-use wait time helps ensure that the index structures are not flushed if the file is reused quickly.

Directory Cache Buffers and Name Space Considerations

Name spaces allow the NetWare file system to support the files and file characteristics of diverse desktop operating systems such as NFS, AppleTalk, HPFS, and FTAM.

Name space support has an impact on the speed and efficiency with which a directory is searched and a file is accessed.

For each name space loaded, NetWare creates a separate set of directory entries and appends them to the existing directory entry blocks.

In this environment, the DOS name is the ultimate reference. When a user searches for a non-DOS file, both the name space directory entry and the DOS directory entry are cached every time.

Adding Name Space at Volume Creation

When name space support is added at volume creation, the system creates the DOS directory entry followed immediately by the name space directory entry.

This virtually guarantees that both entries are in the same directory entry block. When searching for a particular file from a non-DOS client, the file system most probably will only have to cache one block.

The main benefit of adding name space support at volume creation is that it speeds up certain operations, such as directory searches from non-DOS clients and file modifications and deletes.

Using Volumes to Divide Name Space Use

Assigning name space support by volumes can also be used to divide name space allocation. This allows the name space and volume to be used more efficiently.

Additional SET Parameters for File System and Cache

Additional SET parameters can optimize the file system and cache.

Dirty Cache Delay Time

A Dirty Cache Block contains updated information that has not yet been written to disk.

These blocks are flushed to disk when either the client write operation fills a cache block completely, or after the Aged Write default setting has expired.

NetWare v3.12 has a SET parameter that allows the network supervisor to optimize and fine-tune the frequency with which Aged Block Writes occur.

```
SET DIRTY CACHE DELAY TIME =
```

Default: 3.3 seconds

Range: 0.1 to 10 seconds

Increasing the aging parameter to ten seconds allows the system to store up many write operations before going to disk and results in less frequent disk I/O.

Maximum Concurrent Disk Cache Writes

When Dirty Cache Blocks are ready to be written to disk, a system parameter determines how many write requests are put to the elevator for the actual disk I/O.

This parameter is configurable to help fine-tune the system to optimize in either a read-intensive or write-intensive environment.

```
SET MAXIMUM CONCURRENT DISK CACHE WRITES =
```

Default: 50

Range: 10 to 100

In a write-intensive environment, increasing this value improves write performance. Conversely, reducing this value improves the performance of the read operations.

Immediate Purge of Deleted Files

This file system SET parameter configures how file deletions are handled by the system:

```
SET IMMEDIATE PURGE OF DELETED FILES = ON/OFF
```

Default: OFF

The default setting of OFF allows the file system to maintain deleted files on the disk to be purged as necessary.

However, the system must perform additional disk operations to keep the file in the salvage file list.

Changing this parameter to ON decreases the number of operations the system must perform, increasing response time. It also eliminates salvage capability for users.

Files that have been deleted but not purged are not cached as directory entries and do not impact the allocations on the Cache Movable subpool.

Military, government, and other security-conscious agencies usually turn this parameter on.

Disk Read-After-Write Verify

This SET parameter allows you to turn off NetWare's read-after-write verification capability.

SET ENABLE DISK READ AFTER WRITE VERIFY =

Default: ON

This capability complements Hot Fix.

The default setting of ON allows the system to prevent a file from being written to a bad disk block by attempting to read the data after it has been written to disk.

If a problem is encountered, Hot Fix is invoked, the data is redirected to a good area of the disk, and the original blocks are flagged as bad.

For some controllers (such as those used with Compaq disk arrays), the Hot Fix verification is perceived as redundant and the hardware turns the read-after-write and Hot Fix functionality off.

Some SCSI controllers implement read-after-write verification, providing a second and redundant level of error checking.

In a disk I/O-intensive environment, eliminating the redundant layer of verification can increase performance.

If the hardware encounters a problem, NetWare's Hot Fix is invoked as usual to redirect the data.

WARNING: Changing the setting after the driver is loaded can have unpredictable results.

It is better to control the disk drivers individually through MONITOR's "Read After Write Verify" option as explained in *System Administration*. Consult the disk/controller manufacturer before turning off the read-after-write feature.

Fixed Disk Device Drivers and Controllers

NetWare supports the use of different disk controllers and disk drives including intelligent controllers such as a SCSI device or a Disk Coprocessor Board.

An intelligent controller provides support for *scattering* (multiple simultaneous requests to different drives connected to the same controller).

When multiple disks are chained together, the controller can initiate a write to one disk and, without waiting for a completion code, service another disk, and then come back to where it left off with the first request.

This helps optimize disk I/O in a large network configuration.

System Processor

High server CPU use does not always mean the server lacks system processor power. Many resources, including NLMs and NICs, contend for CPU time.

Replacing the server with a new 486 machine may not yield the expected performance gains.

Typically, other server subsystems must be optimized before the system processor emerges as the bottleneck.

Starting MONITOR with the "-p" flag displays a CPU utilization option. This option provides a list of processes and interrupts that identify inefficient or CPU-intensive resources in the server.

One area of focus is server hardware, which is always tied to an interrupt. How often that interrupt is triggered is an indication of which hardware device is being accessed most frequently.

Managing the server from a hardware perspective involves finding ways to steal CPU cycles.

For example, using 32-bit disk controller technology optimizes read and write operations. One 32-bit read request is more efficient than four 8-bit reads since the CPU is interrupted only once instead of four times.

In a sense, Bus Master is the ultimate in terms of stealing CPU cycles. Hardware using this technology can move data in and out of system memory and on to the card without interrupting the CPU.

However, keep in mind that while the Bus Master card has control of the bus, the CPU can't use it.

Table 28 Summary Table

Components	Suggestions for Optimization
Memory Management	Minimize loading and unloading of NLMs to prevent RAM fragmentation. If the RAM becomes fragmented, bring down the server and start it back up. This eliminates fragmentation and makes the contiguous memory available to NLMs.
Communications Subsystems	• Use Burst Mode protocol when it will help. • Increase the packet size default for servers that are not connected through an intermediate router through the STARTUP.NCF file. Use the LIP.NLM to increase the packet size when packets cross through an intermediate router. • Pre-allocate communication buffers according to peak use over time. SET MINIMUM PACKET RECEIVE BUFFERS SET MAXIMUM PACKET RECEIVE BUFFERS SET NEW PACKET RECEIVE BUFFER WAIT TIME • Use NSAR to minimize the amount of broadcast traffic on the network. • Monitor network board statistics: General errors (retries) Enqueued Sends Count

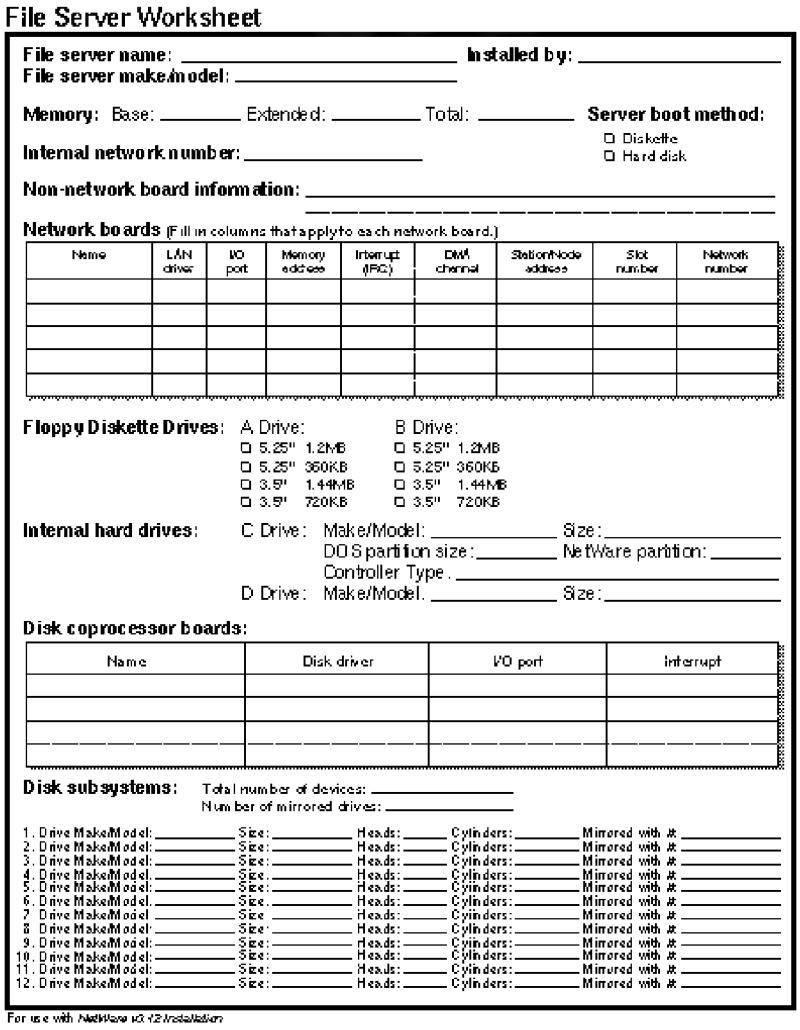
File System and Cache	• File Cache Buffer Pool should be greater than 20 percent of total server work memory. The higher this percentage, the better (40 to 60% recommended). • Volume block size should match cache buffer size whenever possible. Volume block size is set at volume creation. SET CACHE BUFFER SIZE in SERVER.CFG file. Configure cache buffer and volume block size to 8 KB when using NetWare NFS. For multiple-disk volumes, cache buffer size must be smaller than volume block size. • Turbo FATs speed access to large, randomly accessed files. SET TURBO FAT REUSE WAIT TIME • Name space recommendations: Add name space at volume creation. Separate homogeneous volumes from mixed volumes. • SET Parameters: SET DIRTY CACHE DELAY TIME Increase to boost server efficiency. SET MAXIMUM CONCURRENT DISK CACHE WRITES In write-intensive environment, set greater than default. In read-intensive environment, set less than default. SET IMMEDIATE PURGE OF DELETED FILES Turn ON for better performance (lose salvage capability). SET ENABLE DISK READ AFTER WRITE VERIFY. Follow disk/controller manufacturer's recommendations. • Use an intelligent controller for multiple disks chained together.
System Processor	Find ways to "steal "CPU cycles: 32-bit technology EISA, Micro channel bus Bus Master technology

B Worksheets

This section contains worksheets for the following:

File server installation
Workstation installation
Planning directories
Planning users
Planning groups
Planning user defaults
Planning trustee directory rights
Planning trustee file rights

Figure 86 File server installation worksheet



File Server Worksheet

File server name: _____ **Installed by:** _____
File server make/model: _____

Memory: Base: _____ Extended: _____ Total: _____ **Server boot method:**
☐ Diskette
☐ Hard disk

Internal network number: _____

Non-network board information: _____
_____

Network boards (Fill in columns that apply to each network board.)

Name	LAN driver	I/O port	Memory address	Interrupt (IRQ)	DMA channel	Station/Node address	Slot number	Network number

Floppy Diskette Drives:

A Drive:	B Drive:
☐ 5.25" 1.2MB	☐ 5.25" 1.2MB
☐ 5.25" 360KB	☐ 5.25" 360KB
☐ 3.5" 1.44MB	☐ 3.5" 1.44MB
☐ 3.5" 720KB	☐ 3.5" 720KB

Internal hard drives:
C Drive: Make/Model: _____ Size: _____
DOS partition size: _____ NetWare partition: _____
Controller Type: _____
D Drive: Make/Model: _____ Size: _____

Disk coprocessor boards:

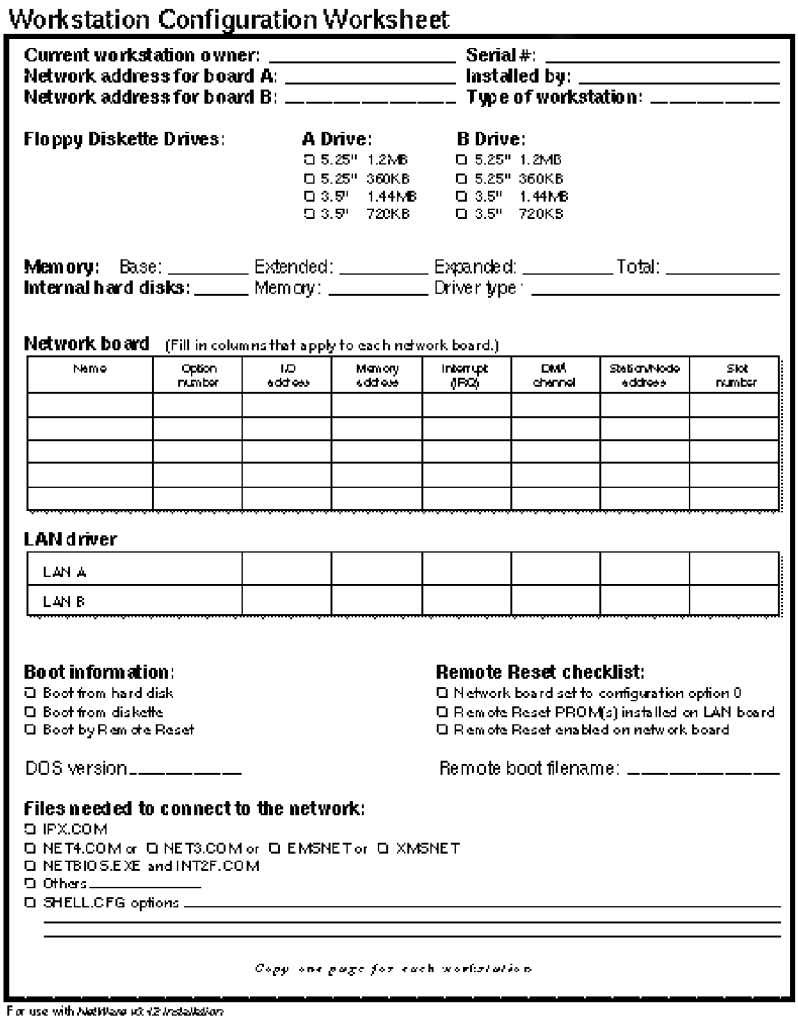
Name	Disk driver	I/O port	Interrupt

Disk subsystems: Total number of devices: _____
Number of mirrored drives: _____

1. Drive Make/Model: _____ Size: _____ Heads: _____ Cylinders: _____ Mirrored with #: _____
2. Drive Make/Model: _____ Size: _____ Heads: _____ Cylinders: _____ Mirrored with #: _____
3. Drive Make/Model: _____ Size: _____ Heads: _____ Cylinders: _____ Mirrored with #: _____
4. Drive Make/Model: _____ Size: _____ Heads: _____ Cylinders: _____ Mirrored with #: _____
5. Drive Make/Model: _____ Size: _____ Heads: _____ Cylinders: _____ Mirrored with #: _____
6. Drive Make/Model: _____ Size: _____ Heads: _____ Cylinders: _____ Mirrored with #: _____
7. Drive Make/Model: _____ Size: _____ Heads: _____ Cylinders: _____ Mirrored with #: _____
8. Drive Make/Model: _____ Size: _____ Heads: _____ Cylinders: _____ Mirrored with #: _____
9. Drive Make/Model: _____ Size: _____ Heads: _____ Cylinders: _____ Mirrored with #: _____
10. Drive Make/Model: _____ Size: _____ Heads: _____ Cylinders: _____ Mirrored with #: _____
11. Drive Make/Model: _____ Size: _____ Heads: _____ Cylinders: _____ Mirrored with #: _____
12. Drive Make/Model: _____ Size: _____ Heads: _____ Cylinders: _____ Mirrored with #: _____

For use with NetWare v3.12 Installation

Figure 87 Workstation Configuration worksheet



Workstation Configuration Worksheet

Current workstation owner: _____ **Serial #:** _____
Network address for board A: _____ **Installed by:** _____
Network address for board B: _____ **Type of workstation:** _____

Floppy Diskette Drives:

A Drive:	**B Drive:**
☐ 5.25" 1.2MB	☐ 5.25" 1.2MB
☐ 5.25" 360KB	☐ 5.25" 360KB
☐ 3.5" 1.44MB	☐ 3.5" 1.44MB
☐ 3.5" 720KB	☐ 3.5" 720KB

Memory: Base: _____ Extended: _____ Expanded: _____ Total: _____
Internal hard disks: _____ Memory: _____ Driver type: _____

Network board (Fill in columns that apply to each network board.)

Name	Option number	I/O address	Memory address	Interrupt (IRQ)	DMA channel	Station/Node address	Slot number

LAN driver

LAN A						
LAN B						

Boot information:
☐ Boot from hard disk
☐ Boot from diskette
☐ Boot by Remote Reset

Remote Reset checklist:
☐ Network board set to configuration option 0
☐ Remote Reset PROM(s) installed on LAN board
☐ Remote Reset enabled on network board

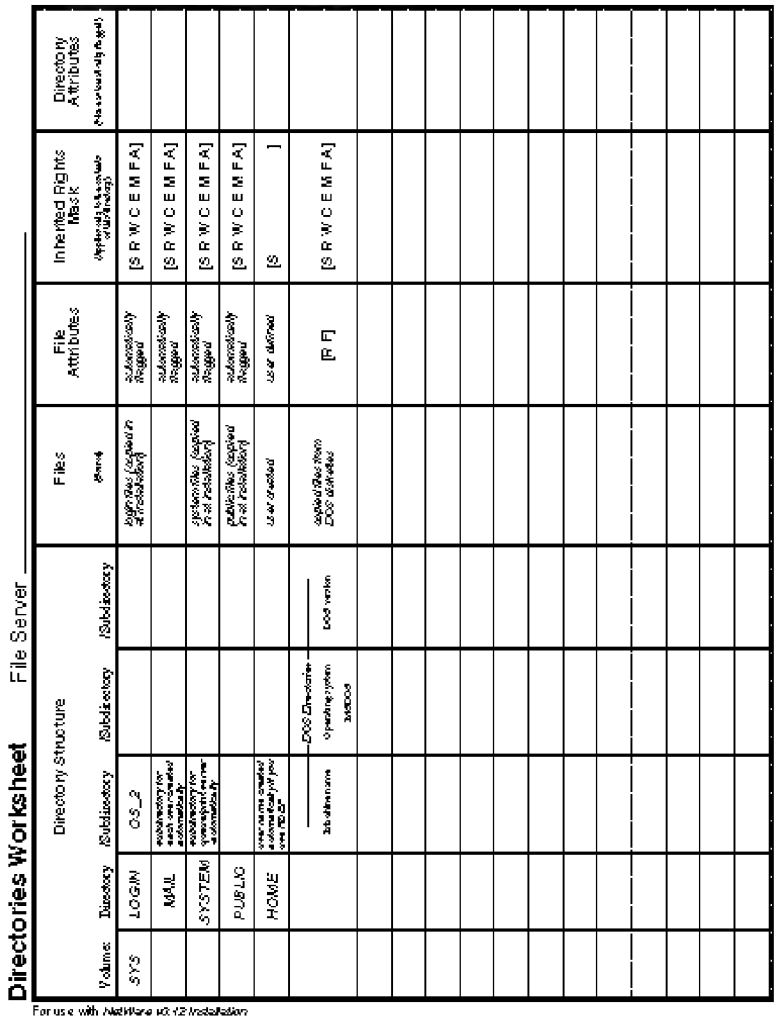
DOS version_____ Remote boot filename: _____

Files needed to connect to the network:
☐ IPX.COM
☐ NET4.COM or ☐ NET3.COM or ☐ EMSNET or ☐ XMSNET
☐ NETBIOS.EXE and INT2F.COM
☐ Others_____
☐ SHELL.CFG options _____

Copy one page for each workstation

For use with NetWare v3.12 installation

Figure 88 Directories worksheet



Directories Worksheet File Server _____

For use with NetWare v3.x/4.x Installation

Directory Structure					Files	File Attributes	Inherited Rights Mask	Directory Attributes
Volume:	Directory	/Subdirectory	/Subdirectory	/Subdirectory	(Name)			
SYS	LOGIN	OS_2			*login files (optional in v4 installation)*	*Automatically flagged*	[S R W C E M F A]	
	MAIL	*subdirectory for each user created automatically*				*Automatically flagged*	[S R W C E M F A]	
	SYSTEM	*operating system files automatically*			*system files (copied in v4 installation)*	*Automatically flagged*	[S R W C E M F A]	
	PUBLIC				*public files (copied in v4 installation)*	*Automatically flagged*	[S R W C E M F A]	
	HOME	*user name created automatically if you create HOME*			*user created*	*user defined*	[S]	
		———	DOS Directories ———		*optional files from DOS diskettes*	[R F]	[S R W C E M F A]	
		Installation name	*Operating system subdirs*	*DOS version*				

Figure 89 User worksheet

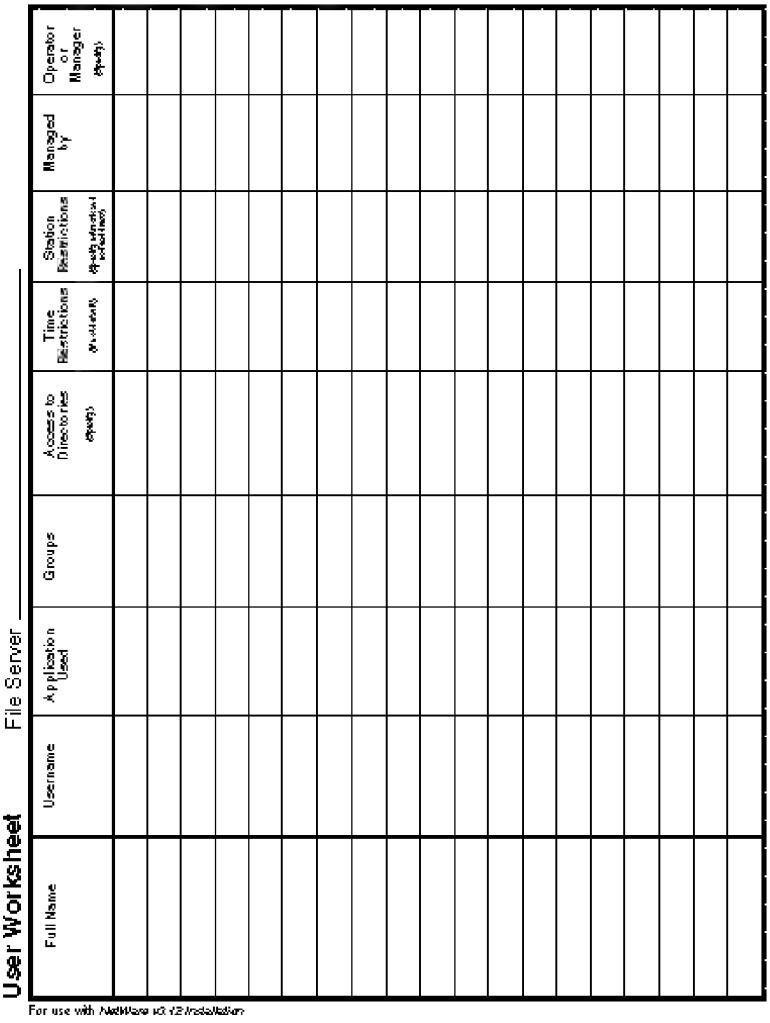


Figure 90 Group Worksheet

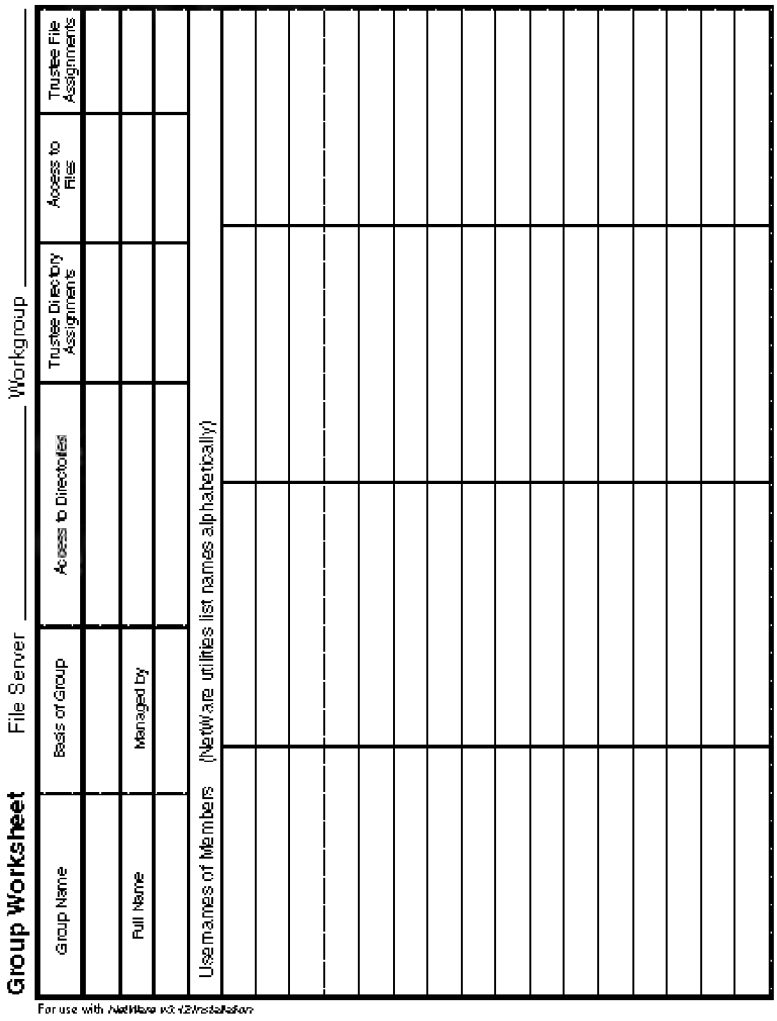


Figure 91 User defaults

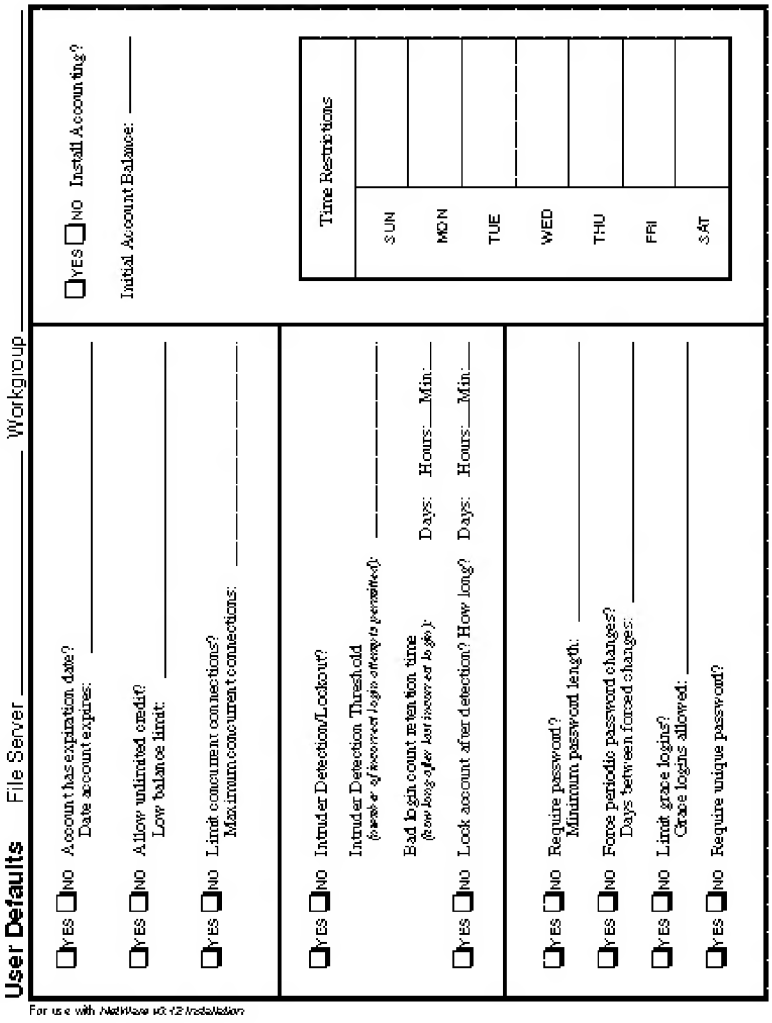


Figure 92 Trustee file security worksheet

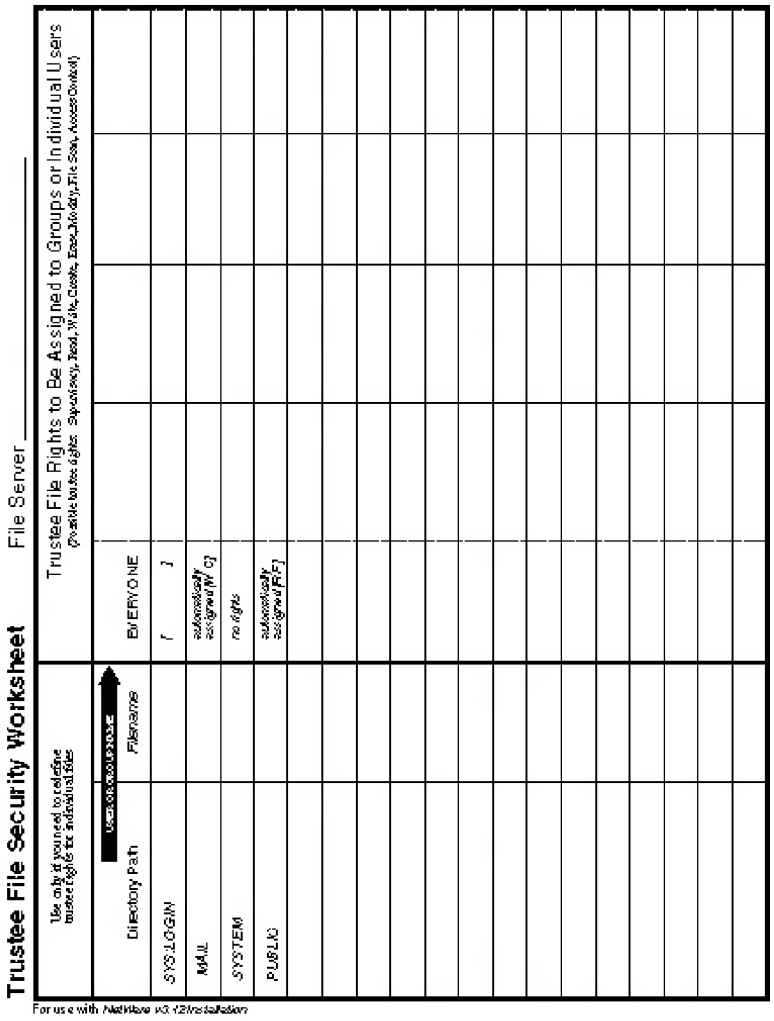


Figure 93 Trustee directory security worksheet